











THE ANNALS  
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MAGAZINE OF NATURAL HISTORY,

INCLUDING

ZOOLOGY, BOTANY, AND GEOLOGY.

(BEING A CONTINUATION OF THE 'ANNALS' COMBINED WITH LOUDON AND  
CHARLESWORTH'S 'MAGAZINE OF NATURAL HISTORY'.)

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" Omnes res creatæ sunt divinæ sapientiæ et potentiæ testes, divitiis felicitatis humanæ :—ex harum usu *bonitas* Creatoris ; ex pulchritudine *sapientiæ* Domini ; ex œconomiâ in conservatione, proportione, renovatione, *potentia* majestatis elucet. Earum itaque indagatio ab hominibus sibi relictis semper æstimata ; à vere eruditis et sapientibus semper exulta ; malè doctis et barbaris semper inimica fuit."—LINNÆUS.

" Quel que soit le principe de la vie animale, il ne faut qu'ouvrir les yeux pour voir qu'elle est le chef-d'œuvre de la Toute-puissance, et le but auquel se rapportent toutes ses opérations."—BRUCKNER, *Théorie du Système Animal*, Leyden, 1767.

..... The sylvan powers  
Obey our summons ; from their deepest dells  
The Dryads come, and throw their garlands  
And odorous branches at our feet ; the Nymphs  
That press with nimble step the mountain-thyme  
And purple heath-flower come not empty-handed,  
But scatter round ten thousand forms minute  
Of velvet moss or lichen, torn from rock  
Or rifted oak or cavern deep ; the Naiads too  
Quit their loved native stream, from whose smooth face  
They crop the lily, and each sedge and rush  
That drinks the rippling tide : the frozen poles,  
Where peril waits the bold adventurer's tread,  
The burning sands of Borneo and Cayenne,  
All, all to us unlock their secret stores  
And pay their cheerful tribute.

J. TAYLOR, *Norwich*, 1818.



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# THE ANNALS AND MAGAZINE OF NATURAL HISTORY.

[ELEVENTH SERIES.]

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".....per litora spargite muscum,  
Naiades, et circum vitreos considite fontes:  
Pollice virgineo teneros hic carpite flores:  
Floribus et pictum, divæ, replete canistrum.  
At vos, o Nymphæ Craterides, ite sub undas  
Ite, recurvato variata corallia trunco  
Vellite muscosis e rupibus, et mihi conchas  
Ferte, Dææ pelagi, et pingui conchylia succo."  
N. Parthenii Giannettasi, Ecl. 1.

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No. 73. JANUARY 1944.

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I.—On some Trematodes from Ceylon. By STEPHEN PRUDHOE, Department of Zoology, British Museum (Natural History).

THE following is a report on the Trematodes in a collection of parasitic worms from Ceylon, kindly presented by Mr. D. R. R. Burt to the British Museum (Natural History).

The labels accompanying the collection do not indicate the positions of the parasites in their hosts, and this information is therefore omitted in the report, which includes descriptions of two new species and notes on some previously-known species from new hosts. With the exception of about a dozen forms described by Lühe (1906) and Fernando (1932-33), the Trematode fauna of Ceylon has not been much explored, and it was to be expected that the present material from ten host-species would be of particular interest.

*Ann. & Mag. N. Hist.* Ser. 11. Vol. xi. 1

**Leclithodendriidae.**

*Ganeo glottoides* Klein, 1905.

A single specimen of this species occurred in the six-fingered frog (*Rana hexadactyla*) at Colombo

**Dicrocoelidae.**

*Paradistomum ceratophoræ* Dollfus, 1923.

To this species are assigned provisionally two specimens, in poor condition, from a unicorn lizard (*Ceratophora tennenti*) at Gammaduwa. Looss (1908) figured and briefly described an unnamed Trematode, later designated *Paradistomum ceratophoræ* by Dollfus, from the gall-bladder of *Ceratophora stoddarti* in Ceylon. Fernando (1932) described further material from the type-host, and, although aware of the history of *P. ceratophoræ*, preferred to rename the species *Paradistomum lanka*. This is contrary to the International Rules of Zoological Nomenclature, as has already been pointed out by Bhalerao (1936).

The latter author (1929) divided the genus *Paradistomum* into "two natural groups: (1) that in which the cirrus-sac reaches or partly overlaps the ventral sucker, and (2) that in which it ends much anterior to the ventral sucker." The present specimens fall into the first group, while *P. ceratophoræ* falls into the second. It must be noted, however, that in the former the region anterior to the ventral sucker is contracted, and therefore it may be assumed that normally the cirrus-sac does not reach the sucker.

The disposition of the vitelline follicles agrees with Looss's description rather than with that of Fernando. Also the length of the eggs is less than that given by Fernando, being 0.032-0.037 mm. as against 0.04-0.044 mm.

**Echinostomatidae.**

*Paryphostomum radiatum* (Duj., 1845).

This species is represented by a single specimen from a cormorant (either the southern cormorant (*Phalacrocorax carbo sinensis*) or the Indian shag (*Phalacrocorax fuscicollis*)).

The terminal spines of the "head-crown" measure 0.15-0.2 mm. in length and 0.037-0.045 mm. in width at the base, and the marginal spines 0.112-0.162 mm. in length and 0.03-0.032 mm. in basal width. Thus the length attained by the spines is slightly greater than that previously recorded for this species (given by Yamaguti (1939) as 0.18 mm. for the terminal spines and 0.141 mm. for the marginal spines). In other respects the specimen agrees well with previous descriptions.

*Nephrostomum ramosum* (Sons., 1895).

Several specimens of this species were found on two occasions in the cattle-ogret (*Bubulcus ibis coromandus*). Apart from the absence of a very shallow depression on the dorsal or anterior border of the "head-crown" and the slightly larger collar-spines, the specimens agree very well with the descriptions of this species by Dietz (1910) and Odhner (1910). In the present material the depression is usually represented by a flattening of the dorsal or anterior border, but sometimes this border forms an uninterrupted convex curve. One specimen, however, does possess the depression indicated by both writers, and for this reason it is considered that the presence or absence of such a depression is not of specific importance. Accordingly, *Nephrostomum bicolanum* Tubangui, 1933, originally separated only by the absence of the depression and the slightly smaller relative sizes of the collar-spines in different regions, is regarded as a synonym of *N. ramosum*.

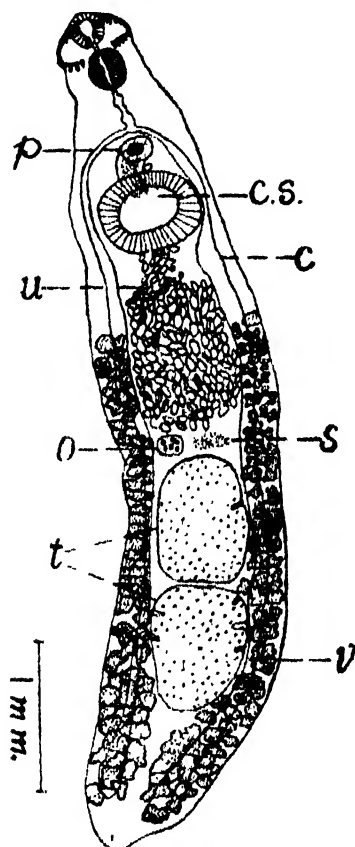
*Echinochasmus famelicus* (Odhner, 1910), n. comb.  
(Fig. 1.)

Syn. *Echinostomum famelicum* Odhner, 1910; *Allechinostomum famelicum* Odhn., 1910; *Echinostoma famelicum* Dollfus, 1932.

A few examples of this species were obtained from the smaller adjutant-stork (*Leptoptilos javanicus*), which had died in captivity at Colombo. Odhner's description was based on a single specimen from the wood-ibis (*Pseudotantalus ibis*) from the White Nile. The measurements of the body, suckers and pharynx in this specimen were clearly larger than in the present specimens, but, as is usual in the better-known Echinostomes, the dimensions

of these organs are probably proportioned to the size of the body. Dollfus recorded *Echinostoma famelicum* from the type-host from French West Africa, and gave the average length of four specimens as 5 mm. and the width as 1-1.5 mm. Apart from stating that the specimens each have twenty-four spines on the "head-crown," Dollfus gave no further details of the anatomy, and some additions to the original description seem desirable.

Fig. 1.



*Echinostomus famelicus*. Ventral view. c, intestinal caecum; c.s., cirrus-sac; o, ovary; p, genital pore; s, "shell"-gland; t, testes; u, uterus; v, vitelline glands.

The body varies in length from 5.3 to 6.7 mm. (8.65 mm.)\*, and the maximum width, which occurs in the middle region, from 1.2 to 1.4 mm. (1.55 mm.). The cuticle, at least on the ventral surface, is armed with

\* The measurements in brackets are those given by Odhner.

transverse rows of scale-like spines extending posteriorly to a short distance behind the ventral sucker. The "head-crown" measures 0.54–0.66 mm. in diameter. The innermost spine on each ventral lobe of the "head-crown" measures 0.077–0.08 mm. in length and 0.027–0.035 mm. in maximum width, while other spines of the "head-crown" measure 0.082–0.097 mm. in length and 0.028–0.037 mm. in maximum width (0.09–0.105 × 0.03–0.04 mm.). The ventral sucker ranges from 0.64–0.69 mm. in diameter (0.95 mm.), and is situated at about 1 mm. from the anterior end of the body. The oral sucker has a diameter of between 0.27 and 0.31 mm. (0.35 mm.). The pharynx is elongate, varying between 0.27 × 0.22 mm. and 0.3 × 0.27 mm. (0.34 × 0.24 mm.). The genital pore leads into a shallow atrium. The pear-shaped cirrus-sac is poorly developed and extends posteriorly to overlap the anterior border of the ventral sucker. It contains an ejaculatory duct, a portion of which is differentiated as a pars prostatica, and a large vesicula seminalis deeply constricted into two equal parts. The ejaculatory duct appears to enter the genital atrium through a large cone-shaped projection or papilla. Viewed from the ventral aspect, in a whole preparation, this projection might be mistaken at a glance for a small sucker surrounding the genital pore. The elongate testes are somewhat rectangular in shape—probably compressed by the contraction of the body—and measure 0.75–1 mm. in length and 0.5–0.75 mm. in width. The ovary is transversely elongate, measuring 0.16–0.21 mm. long and 0.25–0.31 mm. wide. The arrangement of the vitelline follicles resembles that figured by Odhner. The eggs are thin-shelled, and measure 0.112–0.125 mm. × 0.062–0.07 mm. (0.11–0.12 × 0.06–0.07 mm.).

In the figure of Odhner's specimen, the width of the "head-crown" is as great as the maximum width of the body, and the inner limits of the collar-spines on the ventral lobes of the "head-crown" do not overlap the lateral margins of the body in the cervical region. The width of the "head-crown" in the present specimens is much less than the maximum width of the body, and the collar-spines on the ventral lobes extend inwardly beyond the lateral margins of the body in the cervical region to the extent of three or four spines on each lobe.

Both of these features are, no doubt, greatly influenced by the degree of contraction of the body, and therefore are not deemed to be of specific significance.

The principal character used by Odhner for separating *Allechinostomum* from *Echinochasmus* was the presence, in the former, of a papilla through which the male genital duct entered into the genital sinus. The writer has observed a similar projection in the genital atrium of *Echinochasmus coaxatus*, the genotype. Consequently, *Allechinostomum* is considered a synonym of *Echinochasmus*, and its other species, *A. crocodili*, becomes *Echinochasmus crocodili* (Poirier, 1886).

*Himasthla rhigedana* Dietz, 1909.

This species occurred on five occasions in the whimbrel (*Numenius phaeopus phaeopus*) and twice in the crab-plover (*Dromas ardeola*). The material agrees very well with Dietz's description, showing the same variable length of the body and the same variable number of spines (34-38) on the "head-crown." There is, however, a considerable difference in the sizes of the eggs, which measure 0.074-0.081 mm. in length and 0.054-0.061 mm. in width, according to Dietz, and 0.095-0.11 mm. in length and 0.065-0.077 mm. in width in the specimens seen by the writer. Until this species is better known, it seems wise to reserve judgment as to whether or not the present material represents a distinct variety, based on the size of the eggs.

? HIMASTHLA sp.

A single specimen, in very poor condition, was found in the yellow-wattled lapwing (*Lobipluvius malabaricus*). The spines on the "head-crown" have all been lost, but as the cirrus-sac extends posteriorly far beyond the ventral sucker, which lies near the anterior end of the body, the specimen is assigned provisionally to *Himasthla*. The following are the more important characters:—

Length 4.5 mm., maximum width 0.36 mm. Width of "head-crown" 0.19 mm. Oral sucker 0.05 mm. in diameter; ventral sucker 0.18 mm. Cirrus-sac about 0.37 mm. long. Testes elongate, lying one behind the other near the posterior end of the body. Anterior

testis about 0.36 mm. long and 0.18 mm. wide; the posterior testis, somewhat macerated, appears to be about the same size. Ovary median, lying a short distance in front of the testes, and rounded, measuring 0.13 mm. in diameter. Vitelline follicles laterally arranged, extending anteriorly to a level near the posterior extremity of the cirrus-sac. Eggs 0.075–0.082 mm.  $\times$  0.052–0.06 mm.

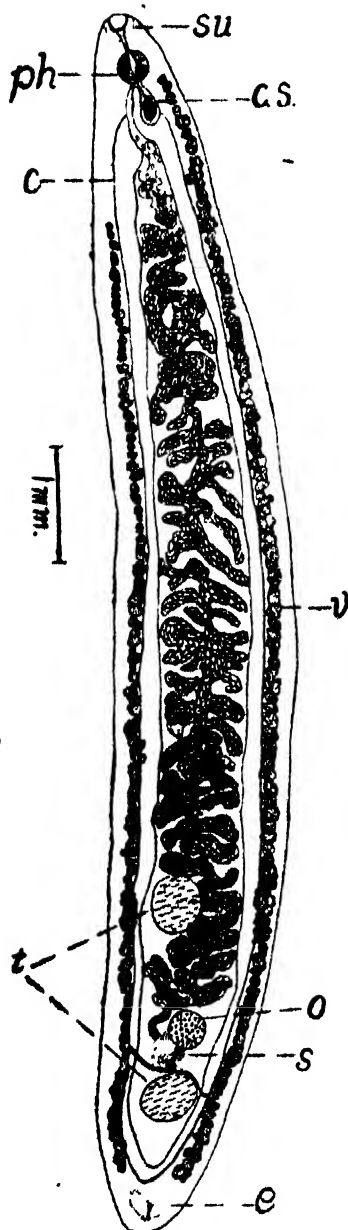
### **Cyclocoelidae.**

#### *Cyclocoelum bivesiculatum*, sp. n.

Several examples were found on two occasions in the Ceylon green-barbet (*Thereiceryx zeylanicus zeylanicus*).

The body is smooth and elongate, tapering more gradually at the anterior than at the posterior end, and varying between 8 mm. and 13.2 mm. in length and between 1.3 mm. and 2.2 mm. in maximum width. The subterminal oral aperture appears to be surrounded by a very poorly developed sucker, which measures 0.24–0.29 mm. in diameter. A short prepharynx is followed by a more or less spherical pharynx measuring 0.24–0.3 mm. in diameter. The oesophagus is 0.13–0.25 mm. long. The two simple intestinal caeca are, as is usual in the family, united posteriorly so as to form a continuous loop. The excretory pore lies in the median line on the postero-dorsal surface of the body, and leads into a short duct which divides anteriorly into two large bulbous sacs. From near the base of the median surface of each sac arises a narrow vessel which runs obliquely, on its respective side, to a point between the intestinal caecum and the vitelline follicles, at about the level of the ovary. At this point the vessel bifurcates into anteriorly and posteriorly directed branches. The anterior branch extends as far as the pharynx, and the posterior to the hinder extremity of the body. These branches are so much convoluted that it was not possible to trace their exact course with certainty. The genital pore lies ventrally to the posterior end of the pharynx. The cirrus-sac extends as far as the posterior wall of the intestinal bifurcation, and contains a short cirrus, a poorly-developed pars prostatica, and a small globular seminal vesicle. The testes, lying one behind the other

Fig. 2

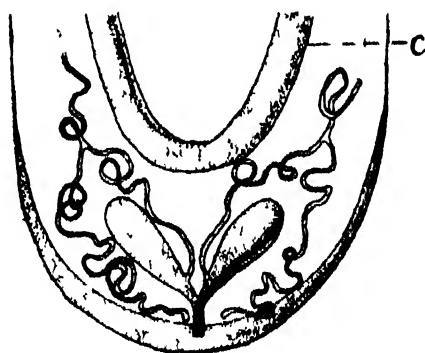


*Cyclocelum bivesiculatum*. Ventral view. c, intestinal caecum; c.s., cirrus-sac; e, excretory vesicle; o, ovary; ph, pharynx; s, "shell"-gland; su, oral sucker; t, testes; v, vitelline glands.



between the intestinal cæca in the posterior region of the body, are rounded and measure from 0.33–0.75 mm. in diameter. The anterior testis may be displaced to the right or left of the median line, while the posterior lies in the median plane in the arch of the intestinal loop. The ovary is also rounded, and measures 0.33–0.37 mm. in diameter. It is situated between the testes in the median line or slightly displaced to either side. In stained whole preparations, the "shell"-gland in the younger specimens is well defined, but in the older specimens it is not so easily distinguished. A receptaculum seminis was not observed. The numerous vitelline follicles are arranged laterally to the cæca, and extend from the level

Fig. 3.



*Cyclocelum bivesiculatum*. Excretory vesicle (diagrammatic).  
c, intestinal cæcum.

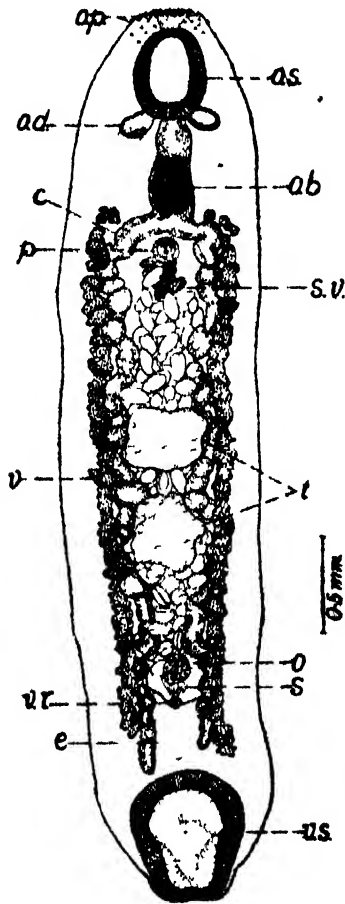
of the genital pore to near the hinder end of the body. The anterior limit of the follicles is, however, not constant, and some specimens show the follicles reaching farther forward on one side than on the other. The uterine coils are very numerous, occupying the entire area between the intestinal cæca anterior to the ovary. They do not overlap the cæca laterally. The eggs are yellowish-brown in colour, and measure 0.11–0.127 mm.  $\times$  0.057–0.065 mm.

So far as is known, with the exception of *Cyclocelum elongatum* Harrah, 1921, the present species differs from all other members of the genus in the form of the excretory vesicle. From *C. elongatum* it is distinguished mainly by the absence of a strong, muscular oral sucker.

**Paramphistomatidæ.***Chiorchis burti*, sp. n. (Fig. 4.)

The material consists of a few specimens from *Rana hexadactyla* from Colombo. Two immature specimens, believed to belong to the same species, were collected

Fig. 4.



*Chiorchis burti*. Ventral view. c, intestinal caecum; e, excretory vesicle; o, ovary; o.b., esophageal bulb; o.d., oral diverticulum; o.p., oral papillae; o.s., oral sucker; p, genital pore; s, "shell" gland; s.v., vesicula seminalis; t, testes; v, vitelline glands; v.r., vitelline receptacle; v.s., ventral sucker.

from the Besra sparrow-hawk (*Accipiter virgatus besra*), also from Colombo, but these are no doubt "pseudo-parasites" ingested with a frog.

The body is flat or slightly concave on the ventral surface, while the dorsal surface is strongly convex both longitudinally and transversely. The length varies between 3.7 and 5.1 mm., the maximum width between 1.1 and 1.3 mm. The ventral sucker, situated at the posterior end of the body, is almost pear-shaped and measures 0.63–0.76 mm. in length and 0.51–0.64 mm. in maximum width. A number of very small papillæ surround the anterior tip of the body; otherwise the cuticle is smooth. These papillæ are more numerous around the oral aperture, which is connected with an oral sucker by a short canal. The oral sucker measures 0.42–0.48 mm. in length and 0.36–0.43 mm. in maximum width. Two distinct oral pouches or diverticula, measuring 0.13–0.16 mm. long, arise from the postero-dorsal border of the oral sucker and are directed posteriorly. The œsophagus measures 0.15–0.21 mm. in length, and at its posterior end there is a strong muscular œsophageal bulb, consisting of about fourteen inner layers of circular and an outer layer of longitudinal muscle-fibres. The bulb measures 0.24–0.27 mm. in length and 0.18–0.21 mm. in maximum width. The intestinal cæca are narrow, undulate dorso-ventrally, and extend to near the anterior border of the ventral sucker. The excretory pore is situated on the dorsal surface of the body, midway between the ends of the cæca. The excretory vesicle is small and simple, and into it open two vessels which diverge to the ends of the cæca, where they curve sharply to extend to the anterior region of the body, forming loops overlapping the cæca as they proceed. The lymph system is difficult to trace, but appears to consist mainly of four longitudinal canals, one situated dorsally and one ventrally to the inner border of each intestinal cæcum. Each canal extends throughout the length of the body, and seems to give off numerous narrow branches which dilate at their extremities. So numerous are these swellings that internally the parenchyme of the body has the appearance of a fine network. The genital pore is situated ventrally to, or immediately behind, the intestinal bifurcation. There is a shallow genital atrium into which, through a stout papilla, the male and female pores open, the former being anterior. The thin-walled cirrus-sac contains a very small portion of the seminal vesicle and an ejaculatory

duct, part of which is differentiated as a pars prostatica. The main portion of the seminal vesicle lies free in the parenchyma and is well developed and coiled. The testes, situated one behind the other in the middle of the body, are slightly lobed or irregular in outline, and measure 0.22-0.45 mm. in length and 0.31-0.67 mm. in maximum width. The ovary lies in the median line, about midway between the posterior testis and the anterior border of the ventral sucker. It is more or less rounded, measuring 0.12-0.18 mm. in diameter. A receptaculum seminis is absent. The "shell"-gland is fairly well developed and lies behind the ovary. The vitelline ducts open into a rounded receptacle, which measures about 0.062 mm. in diameter. The vitelline glands consist of two narrow masses of follicles, arranged laterally and ventrally along the entire length of the cæca. The uterine coils are confined to the area between the cæca and anterior to the ovary, passing the testes dorsally. The thin-shelled eggs measure 0.157-0.17 mm.  $\times$  0.105-0.11 mm.

The genus *Chiorchis* is here accepted in the sense of Southwell and Kirshner (1937), and, with the exception of *C. fabaceus*, the present species can be readily distinguished from others by the greater anterior extent of its vitelline follicles. From *C. fabaceus* the species can be separated by its smaller size, the more posterior position of the ventral sucker, and the absence of a hermaphroditic canal opening into the genital atrium.

In conclusion, I should like to express my thanks to Dr. H. A. Baylis, whose suggestion it was that I should undertake this study, and who gave me much advice during the preparation of the report.

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## II.—*The African Genera allied to Leptacris Walker.* 1870 (*Orthoptera*, *Acrididæ*). By B. P. UVAROV, D.Sc., Imperial Institute of Entomology.

A SMALL number of highly specialized genera grouped round *Leptacris* are characterized by strongly elongated and narrow body, unusually short front and middle legs, metasternal lobes connected along a straight line, and by a tendency to develop a stridulatory apparatus of a peculiar type. This apparatus comprises a series of parallel incrassate veinlets at the base of the interradiar area of the elytron, and modified (densely placed, somewhat expanded and apically curved) inner spine of the hind tibia near its apex. The same type of stridulatory

apparatus recurs in most genera allied to *Oxyrrhypes* (Uvarov, Ann. & Mag. Nat. Hist. ser. 11, vol. x. 1943, p. 577), which on other characters appear to form, with those discussed below, a natural group, to which may be possibly referred also the genera *Spathosternum* Krauss, 1877, *Pseudocarsula* Kirby, 1914, and *Oraistes* Karsch, 1896, all possessing the same stridulatory specialization.

*Key to African Genera allied to Leptacris.*

- 1 (12). Head more or less conical, but the fastigium is not abnormally produced and compressed, its length being not greater than the distance between its base (the line connecting anterior margins of the eyes) and the pronotum.
- 2 (3). Male subgenital plate normal. Female ovipositor short; lower valva very short, with two bow-shaped rows of minute densely placed tubercles. Genotype: *Opsomala fasciculata* Charpentier, 1841 ..... **TROPIDOPOLA.**
- 3 (2). Male subgenital plate very long, laterally compressed, acutely laminate. Female ovipositor of normal type; lower valva with a strong basal tooth.
- 4 (11). Inner margin of hind tibia with not more than 16-17 (rarely 20) spines.
- 5 (10). Fastigium not separated from the vertex by a transverse furrow, broadly sulcate above; surface of the sulcus not punctured.
- 6 (7). Interradial area of elytra with not more than 10-12 specialized transverse veinlets. Fastigium considerably longer than its basal width, acutely conical. Inner face of hind femur with sharp black pattern. Genotype: *Metapa natalensis* Stål, 1878 ..... **METAPA.**
- 7 (6). Interradial area of elytra with more than 30 specialized transverse veinlets. Fastigium shorter, obtusely conical. Inner face of hind femur without sharp black pattern.
- 8 (9). Small. Elytra abbreviated, not reaching beyond the middle of hind femur; specialized interrarial area extending to the apex of elytron. Male cercus normal. Female subgenital plate with a tongue-shaped median lobe. Genotype: *Meruana nyuki* Björstedt, 1909 ..... **MERUANA.**

- 9 (8). Larger. Elytra extending beyond hind knees: specialized interradi-  
al area not reaching by far the apex.  
Male cercus large, foliaceous. Fe-  
male subgenital plate with the  
median lobe bi-emarginate. Geno-  
type: *Opomala pallida* Burmeister,  
1838 ..... **SUDANACRIS, gen. nov.**
- 10 (5). Fastigium separated from the vertex  
by a sharp transverse furrow joining  
the anterior edges of the eyes; its  
surface not sulcate above, rounded  
and as coarsely punctured as the  
sides. Interradi- al area of elytra  
with about 10-12 specialized vein-  
lets. Inner face of hind femur  
purple, with white dots. Genotype:  
*Ischnacrida krausii* I. Bolivar, 1890.. **RHAPHACRIDA.**
- 11 (4). Inner margin of posterior femur with  
more than 20 spines. Fastigium  
sulcate above, short to mode-  
rately long. Body very long, slen-  
der. Genotype: *Leptacris filiformis*  
Walker, 1870..... **LEPTACRIS.**
- 12 (1). Fastigium abnormally produced, its  
length being greater than the dis-  
tance between its base and pro-  
notum.
- 13 (16). Fastigium strongly compressed later-  
ally, sulcate above. Antennae close  
to the eyes. Wings hyaline.
- 14 (15). Total length of head a little greater  
than that of pronotum. Antennae  
about twice the length of fastigium.  
Interradi- al area of elytra with not  
more than 15 specialized veinlets.  
External knee-lobe of hind femur  
laminar and elongate, but not  
longer than twice its width. Geno-  
type: *Gonyacantha lanceolata* I.  
Bolivar, 1890 ..... **GONYACANTHID.**
- 15 (14). Total length of head about twice that  
of pronotum. Antennae much  
shorter than fastigium. Interradi-  
al area of elytra with a very large  
number of very densely placed  
specialized veinlets. External knee-  
lobe of hind femur very long.  
Genotype: *Opomala gladiator*  
Westwood, 1848 ..... **ACANTHOCXIA.**
- 16 (15). Fastigium flat above, with a median  
carinula. Antennae almost at the  
apex of fastigium, longer than the  
head. Interradi- al area of elytra  
with more than 20 densely placed  
specialized veinlets. External knee-  
lobe of hind femur quite short.  
Wings coloured. Genotype: *Mesops*  
*flum* I. Bolivar, 1890 ..... **MESOPSEMA.**

## I. Genus TROPIDOPOLA Stål, 1873

1873. *Tropidopola* Stål, Recensio Orth. 1. pp. 43, 86.1882. *Opomala* Brunner, Prodr. Europ. Orth. p. 2321926. *Tropidopola* Uvarov, Eos, ii. p. 153

A revision of this genus, which shows unmistakable African affinities, but consists mainly of species with southern Palæarctic distribution, was published by me in 1926, and some supplementary data to it in 1937 (Ann. & Mag. Nat. Hist. ser. 10, vol. xix. p. 518). Five species are now known, with five additional subspecies, as follows :—

1. *T. daurica* Uvarov, 1926.—“Dauria”
2. *T. cylindrica cylindrica* (Marschall, 1836).—Sicily, Sardinia, Spain, Balearic Islds., Algeria, Tunisia.
- 2 a. *T. cylindrica obtusa* Uvarov, 1922.—Mesopotamia, S. Persia
- 2 b. *T. cylindrica iranica* Uvarov, 1933.—S.E. Persia.
- 3 *T. turanica turanica* Uvarov, 1926.—Turkmenistan (Transcaspi), Russian Middle Asia.
- 3 a. *T. turanica caspica* Uvarov, 1933.—N. Persia.
4. *T. longicornis longicornis* (Fieber, 1853).—Egypt, Palestine, Syria, S. Turkey.
- 4 a. *T. longicornis græca* Uvarov, 1926.—Macedonia, Greece, W. Anatolia.
- 4 b. *T. longicornis indica* Uvarov, 1937.—India
5. *T. nigerica* Uvarov, 1937.—French Sudan.

## II. Genus METAPA Stål, 1878.

1878. *Metapa* Stål, Bih. Sven. Akad. Handl. v. (4), pp. 51, 97.1922. *Pretoriana* Uvarov, Ann. & Mag. Nat. Hist. ser. 9, ix. p. 99 (syn. nov.).

The genus *Pretoriana* was based on a single female and a re-examination of the type convinces me that its peculiarly excised fastigium, which was regarded as the main generic character, is actually a malformation, probably due to mechanical injury in the earlier stage of development. Moreover, a direct comparison of the female type of *Pretoriana clerki* Uv. with the male type of *Ischnacrida carinata* Miller makes it certain that they are sexes of the same species, which has even an earlier name, since *Ischnacrida natalensis* Krauss, 1878, and *Metapa natalensis* Stål, 1878, are also synonyms of the



same species (see below). The second species that should be referred to the genus *Metapa* is *Ischnacrida pretoriæ* Miller, and both are listed below.

1. *Metapa natalensis* (Krauss, 1878).

1878. *Ischnacrida natalensis* Krauss, Sitzber. Akad. Wiss. Wien, mat.-nat. Cl. lxxvi. (1) p. 46, pl. 2, figs. 17, 17 A, B.  
 1878. *Metapa natalensis* Stål, Bih. Sven. Akad. Handl. v. (4) p. 97 (syn. nov.).  
 1922. *Pretoriana clerki* Uvarov, Ann. & Mag. Nat. Hist. ser. 9, ix. p. 99 (syn. nov.).  
 1932. *Ischnacrida carinata* Miller, Trans. Ent. Soc. London, lxxx. p. 40, fig. 21 (syn. nov.).

The identity of *Ischnacrida natalensis* Krauss and *Metapa natalensis* Stål, described by these authors quite independently, has been established by Dr. Max Beier, who has, at my request, compared their types also with the description and figures of *I. carinata* Miller and found all three species identical. Both Krauss's and Stål's species were published in 1878, but the paper by Krauss was read to the Vienna Academy on 21st June, 1877, and that by Stål to the Swedish Academy on 19th September, 1877. Since no exact date of the publication is known in either case it appears reasonable to accord the priority to Krauss, and to regard Stål's name as both a synonym and a homonym. The case of *Pretoriana clerki* Uv. has been discussed above, under the generic synonymy.

It should be added that Kirby's action (Syn. Cat. Orth. iii. p. 404) in relegating *Ischnacrida natalensis* Krauss to the synonymy of *Metapa usambarica* Karsch lacks any foundation, the last-named species being a member of a very distinct genus, *Meruana* Sjöst.

2. *Metapa pretoriæ* (Miller, 1932).

1932. *Ischnacrida pretoriæ* Miller, Trans. Ent. Soc. London, lxxx. p. 39, fig. 20.

This species differs from the genotype, *M. natalensis* Stål, by the more scolate pronotum with very low median carina, and by the longer fastigium of vertex.

The species is known to me from the following localities :

TRANSVAAL : Pretoria (types of *Ischnacrida pretoriæ* Miller); Hartebeeste Poort Dam, 50 miles N.W. of Johannesburg, 8. v. 1938, 1 ♂, 2 ♀♀ (*E. Burt*). S.

Ann. & Mag. N. Hist. Ser. 11. Vol. xi. 2

RHODESIA: Umtebekwe River, 24. iii. 1935 (*N. C. E. Miller*; see *Trans. R. Ent. Soc. London*, B. v. 1936, p. 160).

### III. Genus MERUANA Sjöstedt, 1909.

1909. *Meruana* Sjöstedt, *Wiss. Ergebn. Kilim. Meru Exped.* 17, Orth., 7, Acrid. p. 181.

A genus with only one known species, *M. nyuki* Sjöstedt, 1909, from the Meru plains, E. Africa.

### IV. SUDANACRIS, nov.

*Opsomala pallida* of Burmeister, 1838, is so well characterized by the genitalia of both sexes that I do not hesitate to erect a new genus for it. The only known species, which should now be called *Sudanacris pallida* (Burm.), has been discussed by Ramme (*Mitt. zool. Mus. Berlin*, 15 Bd. 1929, p. 339, fig. 54).

### V. Genus RHAMPHACRIDA Karsch, 1893

1893. *Ramphacrida* Karsch, *Berlin Ent. Ztschr.* xxxviii. p. 112 (*lapsus calami*!).

1893. *Rhamphacrida* Karsch, *l. c.* p. 114.

This generic name has been employed by Karsch for the first time (*l. c.* p. 112) in a key, and the spelling there should be regarded as a misprint, since on pp. 114–115 the correct spelling is used twice in the headings, while the incorrect one is repeated only in the text.

The genus has been founded on a single species, *Ischnacrida kraussii* I. Bolivar; later two more species have been described, both from single specimens, and it would be premature to attempt to define the interrelations of the three described species which are listed below:—

1. *R. kraussii* (I. Bolivar, 1890).—Angola.
2. *R. rosea* Ramme, 1929.—Cameroons.
3. *R. caerulea* Miller, 1932.—Abyssinia.

### VI. Genus LEPTACRIS Walker, 1870.

1870. *Leptacris* Walker, *Cat. Derm. Salt. Brit. Mus.* i. p. 676.

1873. *Ischnacrida* Stål, *Cf. Vet.-Akad. Förh.* xxx. (4) p. 53 (*syn. nov.*).

1873. *Ischnacrida* Stål, Recensio Orth. i. pp. 44, 87.

1902. *Capellea* I. Bolivar, Ann. Soc. Ent. France, lxx. p. 616.

The difference between *Leptacris* and *Ischinacrida* consists only in the shorter fastigium and practically filiform antennæ in the former, as against the distinctly elongate fastigium and ensiform antennæ in the latter. These characters might be considered of generic value, but the differences break down completely when all the known species of both genera are taken into account, since *I. violacea* Karny, for example, occupies an exactly intermediate position between *Leptacris* and *Ischinacrida*. The variations in the shape of fastigium and of the antennæ must be, therefore, regarded only as specific characters.

The genus, in its expanded state, includes a number of Oriental species, ranging from the Malayan Archipelago into China, India and Ceylon, two known from Madagascar and several African ones. It must be noted that some African species described as members of the genus *Ischinacrida* are now removed elsewhere; they are *I. pallida* Burmeister, 1838 (to *Sudanacris*); *I. carinata* Miller, 1932, and *I. pretoria* Miller, 1932 (to *Metapa*); *I. kraussi* I. Bolivar, 1890 (to *Rhamphacrida*). This leaves in the present genus, *Leptacris*, the following described African species:—

1. *violacea* Karny, 1907.—Anglo-Egyptian Sudan.
2. *testacea* Karny, 1907.—Nyasaland and Gaboon.
3. *monteiroi* I. Bolivar, 1890.—Angola.
4. *elegans* Chopard, 1921.—Kenya.

Of these four species, *L. violacea* is very distinct in its very short fastigium and scarcely ensiform antennæ; but the other three appear to be very closely allied, and it is impossible to say, without the direct comparison of the types, whether they are really different from each other.

## VII. GENUS GONYACANTHELLA Giglio-Tos, 1907.

1907. *Gonyacanthella* Giglio-Tos, Boll. Mus. Zool. Anat. Comp. Torino, xxii. no. 554, p. 13.

The genus was described to include a single species, *G. lanceolata* I. Bol., but later Sjöstedt published a

second one, which I regard, however, as synonymous with the first.

1. *Gonyacanthella lanceolata* (I. Bolivar, 1890).

1890. *Gonyacantha lanceolata* I. Bolivar, Journ. Sci. Acad. Lisbon 1890, p. 215, figs. 7, 7 a.

1907. *Gonyacanthella lanceolata* Giglio-Tos, Boll. Mus. Zool. Anat. Comp. Torino, xxii no. 554, p. 13.

1923. *Gonyacanthella concolor* Sjöstedt, Ark. Zool. xv. no. 22, p. 15, pl. ii. figs. 1, 2 (syn. nov.).

ANGOLA. Moxico district: Villa Luso, 1-8 vi., 6 ♂♂, 6 ♀♀, 5 larvae (last stage); Bihé district: Cohemba, 20-25 viii., 1♂; Huila district: Humbe, June (*M. Burr*).

According to Sjöstedt's description, *G. concolor* differs from *G. lanceolata* in nothing but the lack of a dark dorsal stripe, not a character of specific value in this group of genera. Only one or two of the Angolan specimens before me have the stripe faintly developed, while the majority have none. All other characters given in Sjöstedt's description, as well as his illustrations, are in agreement with the type of *G. lanceolata* which I have examined, and I do not hesitate in synonymizing Sjöstedt's species with that of Bolivar.

The species appears to be widely distributed in Angola and penetrates into Congo (records by Sjöstedt and Giglio-Tos, *ll. cc.*).

I select as the single type of this species a male from Caconda in the Museu Bocage, Lisbon, studied by me.

VIII. GENUS ACANTHOXIA I. Bolivar, 1906.

1873. *Gonyacantha* Stål, Rec. Orth. i. p. 43, footnote (preoccupied).

1906. *Acanthoxia* I. Bolivar, Bol. Soc. Esp. Hist. Nat. vi. p. 392.

Three species have been referred to this genus, as follows:—

1. *A. gladiator* (Westwood, 1842).—Sierra Leone.
2. *A. ensator* (Walker, 1870).—Natal.
3. *A. cultrifer* (Brancsik, 1895).—Zambesi.

The interrelations of these species require a thorough study, since notes by Karny (Sitzber. Akad. Wiss. Wien, mat.-nat. Kl. 1907, cxvi. p. 302) and by Sjöstedt (Ark. Zool. 20 A, no. 15, 1929, p. 22) are based entirely on descriptions.

IX. Genus MESOPSERA I. Bolivar, 1908.

I. Bolivar established this genus for his own species, described as *Mesops filum* I. Bolivar, 1890, but he regarded *Mesopsis* as a member of the subfamily Cantantopinae, and differentiated *Mesopseera* from it only by a few characters of secondary importance. Actually, as I have shown (Eos, xix. 1943, p. 69), *Mesopsis* must be transferred to Acridinae, but *Mesopseera* remains in Cantantopinae, where it comes into the same group as *Leptacris*, while it shows some resemblance also to *Spathosternum*.

III. —*Some Flies of the Family Syrphidæ in the British Museum (Natural History)*. By FRANK M. HULL, University of Mississippi.

SEVERAL years ago the author visited the British Museum (Natural History) with the purpose of studying the types of older dipterists. At that time considerable unidentified Syrphid material was placed in the hands of the writer for further study and determination. This paper presents the third report upon this material. I wish to thank Dr. John Smart, the late Dr. F. W. Edwards, and the Keeper of the Department of Entomology, Mr. N. D. Riley, for the many courtesies and facilities afforded me for the study and illustration of the types of older authors and of other material in the Museum.

*Ceroides oceanica*, sp. n.

Characterized by the shining black colour, with numerous yellow spots. Mesonotum sexpunctate, pleura tripunctate; scutellum yellow, divided by black centrally. Related to *williamsi* Hull.

*Female*.—Length 15 mm. including antennæ; wing 10.5 mm.

*Head*: eyes rather narrowly separated above. The occiput behind the posterior corners of the eyes is tumid, but not much produced above the level of the eyes. Entire vertex, except within the ocellar, triangular, light yellow and shining; ocellar triangle black. The front, except for a black, elongate, marginal spot on the upper

part of the front, is widest posteriorly and connected there by a narrow brown band to the spot of the opposite side and, except for a narrow median brown line from base of style to ocelli, it is pale yellow. The face is black with rather wide median stripe from epistoma that is confluent in its full width with the black style; sides of face shining yellow and confluent with the yellow on the front, which reaches to the extreme base of the antenniferous process or style upon every side except below it. The style is short, stout, barely shorter than the first antennæ joint; antennæ wholly black: first and third joints about equal in length, the second joint almost as long. The antennæ are short, the second and third joints form a tolerably broad spear-shaped head; the tip of the third joint ends bluntly. The face in profile is nearly straight and is barely concave from tip of style below to the low facial bulge just above the epistoma. Cheeks shining black, the lower part of the occiput yellow, the middle and upper part black. *Thorax*: shining black, microsetate; the humeri, the mesopleura, the upper part of sternopleura and upper part of pteropleura are pale; these three pleural sclerites are separated by a brown line and further with an oval, bulging, convex, yellow spot just before the transverse suture of the mesonotum on each side and a longitudinal, prominent yellow stripe from just behind the suture on either side of the mesonotum to, and partly including, the posterior calli, pale shining waxy yellow. The scutellum is pale, shining yellow with a broad, median shining stripe. Squamæ white, white-fringed. Pleura black where not yellow. *Abdomen*: scarcely constricted, chiefly shining black with yellow markings. The second segment is short, narrowest anteriorly, very little wider posteriorly where it is almost as wide as the greatest width of the abdomen, which is at the end of the third segment. The first segment is short, extending, however, beyond the scutellum; it is broad, pale shining yellow with prominent disconnected, lateral, bluntly-rounded knobs scarcely visible from above and with a very broad, median black stripe occupying more than half of the width of the segment. The second segment is shining black except for a posterior band which is narrow and slender in the middle, becoming gradually wider towards the sides and

widest just before it reaches the sides. The third segment is shining black with a narrow, posterior, brownish-yellow band widening to the sides as in the preceding segment. This band does not quite reach the sides and is widely confluent with a very large, lateral, oval, longitudinal, brownish-yellow spot on each side of the segment, the full width of which cannot be seen from above and which almost reaches the anterior margin of this segment; the anterior margin of the spot is broadly rounded. Fourth and fifth segments wholly shining black, the posterior corners of the fourth segment slightly produced. Pile of the black areas black except on the sides of the segment, yellow on the yellow areas. *Legs*: chiefly brown, the narrow base of the hind femora, the narrow apices of all of the femora, the basal two-fifths of hind tibiæ and the basal half of anterior fore tibiæ, are all brownish yellow. Hind femora not greatly thickened, equipped with strong, black, short spines on either side below, more numerous apically. *Wings*: hyaline with a strong, dark, uniform, anterior fore-border occupying almost the anterior half of the wing; it is a little lighter in the costal cell and in that part of the first basal cell below the spurious vein and basal to the small cross-vein. Third longitudinal vein for a short distance on the posterior side, including the whole of the anterior basal corner of the first posterior cell, dark brown. Third longitudinal vein with a well formed but shallow loop; stigmal cross-vein well developed.

*Holotype*: one female. New Hebrides, Pentecost Island, Lamalaga, 23. ix. 1922, T. T. Barnard.

*Tenthredomyia brunnea*, sp. n.

A blackish species. The mesonotum and abdominal segments are largely red-margined; scutellum reddish; face and cheeks yellow, each red bivittate; apparently not closely related to known species.

*Male*.—Length 15 mm.

*Head*: eyes touching for a short distance. The occiput behind ocelli and, for some distance behind eyes, is quite tumid and somewhat swollen and raised; it is deep yellow in colour, becoming reddish about the ocelli, its pile white. Front very small, together with the face bright, clear, pale yellow, faintly shining. Beginning in

the middle of the front there is a pair of red stripes with pointed ends that run diagonally down across the base of the process towards the eye-margin but fall short of reaching them. Beginning a short distance below the base of the style, almost but not quite touching the fronto-facial stripes, are a pair of slightly converging and then slightly diverging, slender, red, submedian vittæ that are confluent just above the epistoma. Cheeks and a broad vertical stripe from eye-margin to bottom of face and edge of oral margin red in colour, leaving a clear, yellow triangle with one side upon the margin of the eye. Antennal style light red, a little longer than the first joint of the antenna, the second and third antennal joints are subequal, barely longer than the first; second and third joints rather thick and club-shaped, the style short and pointed; first two joints black microsetose. *Thorax*: broadly dull black in the middle, micronodular, setose, the setæ both black and pale, but chiefly pale. Lateral margins of the mesonotum, the whole of the humeri, whole of the scutellum and all of the pleura except for the black, lower sternopleura and an obscure, narrow, yellow mesopleural stripe, everywhere light reddish brown. Squamæ brown, brown-fringed. *Abdomen*: not at all petiolate; widest at the end of the first segment, barely less wide at the end of the second segment; fourth segment somewhat more narrow at its apex because of its greater length. The first three segments are about equal in length; the fourth segment is half again as long as the third. The entire abdomen is very thick and subcylindrical, especially so on the last two segments. Hypopygium very large and prominent, visible from above. Abdomen almost wholly black, slightly obscured by pale yellow pollen; there is a large, obscure, reddish spot on each side of the first segment that continues narrowly onto the basal corner of the second; there is an obscure small triangle in the middle of the third segment a short distance from the apex. There is a yellow, almost complete, narrow, apical band on the third segment and a slightly wider one on the fourth segment and traces of a reddish band on the second segment. Entire abdomen flat, long setose, the setæ golden in colour and proceeding from raised spots with interruptions in the pollen. *Legs*: light red in colour;



the femora show slight indication of yellow about the apices. Hind femora slightly thickened on the basal half without any spines beneath. Pile of abdomen pale. *Wings*: the entire antero-basal half, including the anterior border of the fifth longitudinal vein before the small cross-vein, is light yellow. Beginning at the furcation of the second and third longitudinal vein, and including all of the area from that point above the spurious cross-vein, and including the anterior basal corner of the first posterior cell and all of the remainder of the subcostal, marginal and submarginal cells, together with a diffuse spot at and below the small cross-vein, all dark brown in colour. The stigmal cross-vein is well developed, with a strong but not acute kink in the third longitudinal vein and without spur.

*Holotype*: one male. S.W. Africa, Aus., Jan. 1930, R. E. Turner, 1930: 117.

*Ceriodes minuta*, sp. n.

General appearance similar to *gambiana* Saund., but smaller, with more globose apex to the abdomen, the colour-pattern and details are very different; not apparently closely related to any described species. Distinguished by the micronodulose mesonotum and scutellum, the pinkish-brown margins of mesonotum, upper pleura, and whole scutellum.

*Male*.—Length 9.5 mm., 12 mm. including antennæ; wing 7 mm.

*Head*: eyes very narrowly separated; approximate for a very short distance. The upper occiput for a short distance on either side of the upper eye-corner is light yellow; the region about the ocelli is light reddish brown, quite convex and narrowly yellow just before the approximation of the eyes. The front and face are clear pale yellow marked with red and brown. There is a round reddish area just above the base of the antennæ that reaches down the sides on either side of the antennæ where it becomes brown in colour; it narrowly misses the eye-margins and continues almost vertically downward but actually converges and forms an extensive, subquadrate, brown spot on the upper part of the face; in the middle of this spot, however, lies a pair of tiny, pale yellow spots; the brown continues below the middle

of the face as a narrow brown line, the two lines meeting at the epistoma, and within the area enclosed by these lines is a large, wide, pointed wedge of yellow. The cheeks are dark brown. The head is without style and the antennæ slender, first and third joints light reddish brown, the second joint dark brown, the style short. *Thorax*: the middle of the mesonotum is opaque, micronodulate, black in colour, with pale setæ. The black area is interrupted for a short distance at the suture. There are three yellow pollinose lines in the black area; only the outer ones continue to the anterior margin. The humeri are yellow; the broad sides of the mesonotum and the upper part of the mesopleura are reddish brown in colour; a narrow vertical yellow stripe runs through the middle of the upper part of the sternopleura and again through the metapleura, the former stripe continuing just in front of the wing and on for a short distance along the suture of the mesonotum. Scutellum reddish brown, the middle of the base blackish, the margin narrowly and obscurely yellowish in the middle. *Abdomen*: quite petiolate, narrowest in the middle of the second segment. The base of the first segment and apex of the second segment are both twice as wide as the middle of the second segment; beginning at the third segment the abdomen is expanded into a large, broad, cylindrical club, of which the large, rounded hypopygium forms a prominent part. *Abdomen*: dark, dull brown in colour, almost black in places; the first segment, except for an elongate, basal, median, black V, together with the second segment, except for a conspicuous, posterior, marginal, pale yellow annulus, are entirely brownish red. Third and fourth segments and hypopygium very dark, the last two segments with conspicuous, narrow, posterior, annulate cross-bands. Pile of abdomen microsetate and pale in colour, proceeding from raised places. On the fourth segment there are a pair of obscure, narrow, pollinose, crescent-shaped marks; and between them there are equally obscure, slender vitæ. *Legs*: chiefly light reddish brown; the apical third of all of the tibiæ and the basal fourth of the hind femora are light yellow; the greater part of the remainder of the hind femora is dark brown; the hind femora are slightly thickened dorsally just before the middle, and

equipped ventrally upon the outside with one or more rows of very short, black, inconspicuous setæ. *Wings*: the anterior border is light brown, barely darker near the apex; the brown colour is confined to the costal, subcostal, marginal and submarginal cells, to the basal cell above the spurious vein and for some distance along the lower side of the third longitudinal vein beyond the kink. Third longitudinal vein with a decided but rounded kink in the vein; the angle thus formed is almost a right angle; there is a very strong stigmal cross-vein present.

*Holotype*: a male. Cape Province, Somerset East, Nov. 1930, South Africa, R. E. Turner, 1930: 593.

*Ceroides africana*, sp. n.

A large fly of the type similar to *bezzi* Herve-Bazin, but much larger; whole margin of wing before the third vein dilutely yellow-brown, the cells clearer in their centres, the brown-black mesonotum has the transverse suture velvet-black, linearly marginate.

*Female*.—Length 17 mm.; wing 13 mm.

*Head*: occiput extremely tumid and highly raised above the margin of the eye; dark, shining red in colour, including the ocellar region. The front is black. The face is straight in profile and together with the cheeks is light red in colour, with a prominent, black, wedge-shaped stripe separating cheeks from face. There is no antennal process although there is a square, tubercular, raised base from which the antennæ proceed. The antennæ are fairly elongate; the first joint is quite long and slender, as long or slightly longer than the remaining two joints; the third joint is barely longer than the second, black in colour; the other two joints are dark, reddish brown. *Thorax*: dull black, very broad with an opaque, velvet-black, narrow, transverse stripe along the margin of the suture; its inner ends are rounded, the whole stripe is slender, and there is a similar, basal, marginal stripe on the scutellum. Scutellum black, its margin obscurely light brownish. The posterior calli are light brown, the pleura black but obscurely reddish on the mesopleura. *Abdomen*: strongly petiolate; the second segment is broad, the remaining segments correspondingly large. The first segment is wholly black, the second segment is rather light reddish brown, the basal half subtranslucent

and obscurely blackish in the middle and obscurely yellow along the posterior margin. Third segment dark brown or black, becoming more reddish on the posterior half and with a narrow, linear, posterior, submarginal blackish stripe or line, which, however, does not reach the side-margins. Fourth segment black, fifth segment reddish brown and pointed. The third, fourth and fifth segments form a pointed club. Abdominal pile wholly pale. *Legs*: the basal halves, or more or less, of all of the femora are black; the remainder of the femora and the tibiæ very dark brown; tarsi dark brown to black. The hind femora are very slightly thickened and without ventral spines; the pile of the legs is setaceous, wholly pale brassy and appressed. *Wings*: the anterior border is widely yellowish in places and becomes obscurely brown over areas including the costal and subcostal cells, and the marginal cell except for an almost clear streak in its distal middle, also the whole of the submarginal cell except for one or two clear spots, also the whole of the first basal cell above the spurious vein and the narrow posterior margin of the third longitudinal vein are all light brownish yellow. Third longitudinal vein with a wide, shallow bend and no spur; stigmal cross-vein very faint.

*Holotype*: a female. Madagascar, Betsileo, Rev. D. Cowan, 82: 30.

*Cerioides globigaster*, sp. n

Related to *maculipennis* Herve-Bazin, the wings are hyaline, the front (of female) is bipunctate.

*Female*.—Length about 10 mm.; wing 9 mm.

*Head*: broadly reddish about the region of the ocelli and the upper occiput almost to the corner of the eyes. The reddish region of the vertex is produced forward to the antennal process over a median trench or double crease or concavity which is deepest just in front of the ocelli. The red colour runs sharply down on either side of the style until it is even with the middle of the sides and then is produced out towards the eyes; it fails by a considerable extent of reaching the eyes and ends sharply. Below the antennal process, confluent with the red of the process, there is a second prolongation that extends towards the eyes; it fails to reach it and ends

bluntly ; the latter, and indeed all of the red of the face, except as hereafter noted, is confluent with a pair of submedian, slender, brown stripes that are rather widely separated in the middle and reach the epistoma. On either side of these brown stripes there are a second pair, reaching from the posterior corners of the oral margin at the lowest point of the face, upward a short distance above the bottom of the eyes. Remainder of face and front, except for a pair of dark brown, velvet, opaque spots on each eye-margin at the extreme upper part of the front, everywhere very pale yellow, rather brownish yellow or clay-coloured. The reddish areas of the face and front are covered with short, silvery pubescence which is more or less confined to these areas, but which is generally extensive on the lower half of the face. Cheeks and lower part of the occiput pale clay-coloured. Antennal process light brownish red, subtranslucent, a little longer than the first antennal joint ; the antennæ are of only moderate length ; the second and third joints are subequal, are barely longer than the first joint, are rather wide and compact in the middle, forming a two-jointed club ; the third joint has a short, stubby, very sharp arista ; the first and second joints are black. Third joint on basal half brownish red, on outer half darker brown. *Thorax* : convex, dull, obscure, unicolourous light brown ; the humeri have a trace of yellow ; the dorsum is pale pubescent or pollinose and black micro-nodulate ; their setæ are black and there is some additional, pale yellow, short pile mixed with this. The scutellum is similar to the dorsum ; the base is broadly concolourous and the rim narrowly yellow ; it is short, small, and several times as wide as long. Pleura wholly reddish except for an inconspicuous, narrow, vertical, obscurely yellowish stripe along the upper anterior margin of the pteropleura. *Abdomen* : somewhat constricted at the anterior end of the second segment ; this segment is very small and shorter than the first segment ; it is subtrapezoidal in shape ; the second segment is almost half again wider posteriorly than anteriorly. The second segment has a yellow, vertical, posterior margin, on the sides that is angularly and anteriorly directed towards the mid-line. The third and fourth segments are developed into an exceedingly short, thick, rounded

club ; the abdomen, viewed from the side near the anterior part of the fourth segment, is almost as high as that segment is long. The globose appearance of the abdomen is further increased by a constriction a short distance from the end of the fourth segment. Fifth segment very small and inconspicuous. First segment, except for the narrow lateral flare of the anterior margin, and the whole of the third, fourth and fifth segments, brown in colour and obscurely shining nodulate setose, the setæ golden in colour, sharp, slender and appressed. *Legs* : wholly light brownish red ; the basal three-fourths of the hind femur with almost the whole of its dorsal length, and considerable portions of the anterior femora and the whole of the tarsi covered with shimmering, whitish pubescence. Pile of the legs pale ; there is a double row of black spines, stout and sharp, in the apical two-thirds of the hind femora. Hind femora moderately thickened, especially on the dorsal half. *Wings* : hyaline ; there is a suggestion of pale yellow border along the anterior margin, actually slightly brownish towards the end of the second longitudinal vein. The brown colour is confined to the costal, subcostal, marginal and submarginal cells. There is no true stigmatic cross-vein, though there is a slight thickening. There is a well-developed, though not very deep kink in the third longitudinal vein.

*Holotype* : one female. Pretoria, 10. x. 1914, G. A. H. Bedford, presented by Imperial Bureau of Entomology., 1922 : 485.

*Monoceromyia gloriosa*, sp. n.

Related to *pulchra* Saunders and *hopei* Saunders, the pattern of the vittæ upon the pale yellow face is different ; mesonotum black behind the notopleura ; last segments of the pointed abdomen largely golden pollinose, the fourth divided by a black wedge from a basal fascia.

*Female*.—Length 20 mm. without antennæ or style. Wing 14 mm.

*Head* : vertex and upper part of occiput, except for a brown transverse band across ocelli, bright opaque yellow. The whole of the front (except for a minute spot above the antennal style), the whole of the face (except for two slender, crescentic brown lines from base

of style, and together with a pair of transverse, small, elongated spots some distance below the above marks which are confluent with a fine, vertical brown line on each side of the middle of the face), all very pale clear yellow. The cheeks are clear yellow with a brown, oblique band from eye-margin to epistoma that is confluent with a small, brown, vertical spot in the middle of the face just above the oral margin. This brown vertical spot is connected with a fine pair of brown lines in the middle of the face. Face with a fine, shimmering, white pubescence and very scant white pile on the upper part. Style well developed, not as long as the horizontal length of the eye, brown in colour, the first joint of the antennæ a little shorter than the style, reddish brown, the remaining joints missing. The upper occiput is very much tumid and produced, especially posteriorly. The middle of the occiput about the middle of the eye is black in colour; just above the black part where the margins begin to be well developed there is a patch of golden pubescence. The face in profile is quite straight, but quite puffed-out and swollen in appearance, that is best developed well forward from the eye-margins. *Thorax*: black, shining in the middle and microsetate; the humeri, a large subquadrate wide area from humeri to suture along the mesonotal margin, the whole of the meso- sterno- and upper pteropleura and the whole of the scutellum, pale clear yellow. Pile of scutellum microsetate and pale yellow. *Abdomen*: elongate, highly petiolate, the greatest constriction occurs at the end of basal third of second segment; the end of third segment is about as wide as the flared lobes of the first segment, the remaining segments are about as long or a little longer than the first and second segment and developed into a beautiful, convex, subcylindrical, pointed club-shaped body, which makes it a fine mimic of a *Polistoid* wasp. The first segment is wholly pale yellow except for a median, rather wide, brownish-black vittæ. Second segment with the posterior margin rather widely pale yellow, the whole of the remainder light brownish red. Third segment black, the posterior border sharply to the margin with a transverse, pale yellow band that is very short in the middle of the segment, reaches the sides but is expanded in the middle on each side, anteriorly,

to form a large yellow spot with rounded anterior margins. Fourth segment with a similar, posterior, shining yellow band that is less produced on either side anteriorly; the black of the anterior six-sevenths or more of this segment is widely obscured by a dense, black-punctate, golden mat or area of pubescence, which is restricted by the shining black ground-colour as follows:—a narrow, linear margin on the anterior edge of the yellow transverse band on the posterior part of this segment, a narrow transverse stripe on the base of this segment which narrowly reaches the sides of the segment at the anterior corners and becomes longer near the middle, and exactly in the middle it is produced posteriorly as far as the posterior black line to form a narrow, pointed wedge. The whole of the fifth segment, except for an almost unnoticed basal median spot, is golden pubescent. Pile over the golden pubescent area and over the yellow areas yellow; on the black areas black. *Legs*: first two pairs missing, the hind legs are light reddish brown, the hind tibiae are a little darker in the middle but are still light red and their bases and the apex of the hind femora yellow; hind femora slender. *Wings*: hyaline; the subcostal cell is clear except its base, the first basal cell above the spurious vein, the whole of the marginal, the submarginal and the basal, anterior corner of the first posterior cell and a narrow region about the small cross-vein and on either side of the last part of the fifth longitudinal vein and the anterior margin of the basal part of the fifth longitudinal vein are brown in colour. Third longitudinal vein with a slight, shallow bend and no spur. The brown at the tip of the wing, beginning at the anterior cross-vein, is darker in colour; the rest of the brown is more yellowish or reddish.

*Holotype*: a female. Uganda, Mt. Maroto, Maroto Stream, 3700 ft., 25. 1. 13, W. P. Lowe, 1913: 127.

*Pseudovolucella ochracea*, sp. n.

Related to *apimima* Hull, the anterior half of the abdomen is brownish yellow, the posterior half shining black.

*Male*.—Length 14 mm.; wing 12.5 mm.

*Head*: the eyes touch for a quite short distance; the upper facets are very little enlarged, the vertex is dark,



opaque brownish black. The front is separated by a narrow linear groove running to a small, vitreous, bare space above the antennæ ; front, together with the broad sides of the face on the upper part, pale yellowish-brown pollinose. The yellow-brown pollinose sides of face descend as a narrow wedge to the epistoma, where it becomes pubescent, obscuring the ground-colour. The yellow pollen continues narrowly beneath the antennæ and the low facial knob. There is a broad middle dark brown to black stripe on the face slightly diverging above, fading away into the paler colours. Cheeks reddish brown, separated from the face by a wide, oblique stripe of dark brown, which is sparsely pubescent. The pile of the vertex is long, black, and erect, together with similar pile on the front ; pile of the occiput, except narrowly above, pale yellow ; pile of upper part of face, cheeks and the brown stripe on each side shining yellow, middle of face bare. The face descends rather deeply below the eyes and is barely concave between antennæ and tubercle. The tubercle is considerably further forward than the base of antennæ. The antennæ are black, the third joint dark brown, barely longer than wide, subquadrate, the arista long, very plumose with about thirty two upper rays. Eyes bare. *Thorax* : wholly dark, obscurely shining brown, the ground-colour is evidently black, obscured by brown pollen ; the whole dorsum has a faint greenish cast. The scutellum is wholly pale yellowish brown. The pile of pleura, the dorsum and the disc of the scutellum is thick, long, erect and pale shining yellow. The margin of the scutellum is without bristles but with hair twice as long as on the disc. *Abdomen* : very broad, but little longer than wide, widest at the end of the second segment ; the whole of first segment and the basal two-thirds of the second segment to a slightly greater extent on the sides of this segment, are wholly pale brownish yellow and faintly shining, covered with dense, rather long, erect, shining yellow pile. The second segment is almost orange in colour. Remainder of abdomen obscurely shining black, except for a narrow and narrowly divided, almost unnoticeable, subbasal, mahogany band which does not nearly reach the sides. The whole of the remainder of the second segment, and the third and fourth is covered with black pile, shorter than that on the anterior part of the abdomen and

appressed in the middle and erect on the sides. The hypopygium is very large and concealed by the end of the fourth segment with numerous, exceedingly long, slender, black hairs. *Legs*: the femora, except the narrow apices of the first and second pairs, are very dark brownish black. The hind tibiae are dark brown basally, still darker on the remainder and ending in a ventral (extended position) short, rounded scoop; their pile on the outer lateral surface is wholly black and setaceous, on the inner lateral surface black basally, more dense, appressed and golden apically. Fore and mid-tibiae dark brown along the greater middle portion and narrowly light brown apically. The first and second mid-tarsal joints are brownish yellow, remainder of tarsi dark brown to black. The hind femora are very greatly thickened, but all of the thickening lies on the dorsal half on the middle three-fifths. Ventrally the hind femora are slightly concave. The hind trochanters have an obtuse spur. *Wings*: almost hyaline, the third longitudinal vein straight, there is a prominent, subquadrate brown spot in the middle of the wing back of and including the stigmal region.

*Holotype*: male. Burma, Lt-Col. Bingham, 1896: 281 *Paratype*: a male, same data.

*Criorhina pallipilosa*, sp. n.

Mesonotum shining black anteriorly, pale brownish-white pollinose posteriorly. Abdomen wholly yellow pilose. Face deeply conical, shining and largely bare, related to *imitator* Brunetti.

*Male*.—Length 12.5 mm., wings 12 mm.: vertex of head to tip of epistoma 5 mm.

*Head*: eyes bare, pile of vertex long and black, the whole of the front and the entire middle part of the face is densely covered with pale, brownish-yellow, extremely minute pubescence. The face is very conical and deeply produced. The lower portion of the face, from bottom of eyes to epistoma, is almost as long as the height of the eye. The sides of the face are shining brown, darker in the middle and ventrally. The face is concave below the antennæ, very slightly bulging at a level equal to the bottom of the eyes; the proboscis is very elongate and

black. The antennæ are small, short, brown in colour, the third joint quite short and very broad, and directed extensively downward ventrally, but rounded. The arista is black or dark brown. *Thorax*: shining black on the posterior half, anteriorly from the suture it is covered with pale, brownish-white pollen. The scutellum is similarly pollinose but more metallic. The pile of the thorax, pleuræ and scutellum is everywhere long, exceedingly long on the scutellum and, except for a band in the middle of the thorax behind the suture, which is black pilose, it is everywhere pale yellow. *Abdomen*: short, pale greyish pollinose on the whole of the first segment and everywhere on the second segment except for an obscure, median stripe, which extends narrowly along the base in the middle, but not as far as the sides, and for a wider, pre-apical band almost to the sides; the third segment is similarly pollinose except for a median, transverse band, a median, large, basal V not quite reaching the posterior margin, but narrowly reaching along the base to connect through a basal corner-spot with the middle band. The fifth segment is wholly densely pollinose, except for a small, median basal V. Hypopygium quite large, broad and wholly shining black. The whole of the abdomen is light yellow, shining pilose, the pile on the extreme posterior margins of second, third and fourth segments is more thick and is like tufted fringes. *Legs*: all of the femora are feebly shining black, except at the extreme apical tips where they are brownish yellow. The hind femora are slightly thickened, but only on the dorsal middle to the basal two-thirds. All of the tibiæ are yellowish brown; their anterior fourth is narrowly and the hinder pair on the apical three-fourths brownish. All of the tarsi except the last one or two joints are light brown; the apical joints are dark brown. The pile of the legs is everywhere pale. *Wings*: quite pale brown, the veins light brownish yellow. Stigmal cell brownish yellow; there is a slight brown cloud at the furcation of the second longitudinal vein; vena spuria poorly developed.

*Holotype*: a male. Kashmir; Gulmarg, 8500 ft., summer 1913, Lt. Col. F. W. Thomson, 1914: 182. *Paratypes*: three males, same data.

*Criorhina criouarcos*, sp. n.

Thorax and abdomen black pilose, the latter with a tuft of golden-red pile on each side at base; face produced forward as a long, slanting cone. Not apparently related to the few described species from the Asiatic region.

*Female*. Length 14 mm.; wing 11 mm.

*Head*: the eyes are bare, the vertex dully shining brownish black, the front shining black and merging into the vitreous, dark mahogany-red face; the margin of the epistoma and cheeks are more shining blackish. The antennæ are short, light brownish red, the third antennal joint is almost twice as wide as long and rounded and thickest at the bottom. The arista is long, slightly thickened basally and brownish in colour. The face is produced strongly forward as a long, diagonal, slanting cone; the profile of the face is almost straight and barely concave upon the lower half above the epistoma. The face is very little produced downward and the epistoma is somewhat more pointed than the face. The pile of the front, vertex, cheeks and the margin of face along the eyes is black. *Thorax*: rather slender and about as wide or scarcely as wide as the eyes; it is opaque, velvety-black with suggestions of still blacker, linear stripes. The pleura, humeri, dorsum and scutellum are covered with very long, upon the scutellum exceedingly long, smoky, brownish-black pile. *Abdomen*: of the usual type; chiefly shining black and more dully shining on the basal segments with a strong tuft of shining, golden-reddish pile on either side of the second segment near the base and lateral margin; elsewhere the pile is the same colour as the thorax. *Legs*: light brownish orange in colour, the last two posterior tarsi and the last four anterior tarsi are blackish; the pile of the femora and tarsi and of the extreme apex of the hind femora is golden: elsewhere the colour of the femora is obscured by the sooty-purple or brownish black, very long pile. The hind femora are very slightly thickened. *Wings*: strongly tinged with yellow; the veins are yellow, except that the tip of the costa, the second longitudinal vein, the subapical and posterior cross-veins and a narrow area on either side of these veins are brownish.

*Holotype*: a female. Burma, Lt.-Col. Bingham, 1896: 281.

*Criorhina bomboides*, sp. n.

Abdomen black. black pilose; thorax black with purplish-brown pile, face moderately produced downward and a little forward; related to *crioarcos*, the epistoma is produced chiefly downward.

*Male*.—Length 14 mm.; wing 12.5 mm.

*Head*: the eyes are bare, approximate for short distance and almost touching; the very small vertical triangle, almost confined to the ocelli, is dark brownish black with long brown pile and flat-appressed yellow pubescence in front of the anterior ocellus. The front is bare, brown and shining in the middle and above the antennæ; however, at the junction of the eyes along the sides of the front, the front as well as a wide, lateral, frontally connected facial stripe, is light brassy-yellow pubescent; the pubescence is dense and hides the ground-colour. The middle of the face and conspicuous facial knob is dark, dully shining brown and faintly grooved on the tubercle. Cheeks shining dark brown, the face produced chiefly, but not extensively, downward; it is also produced forward at the tubercle a little farther than the base of the antennæ. The antennæ are short; the first, second and base of third joints are light brown; remainder dark brown; the basal third of arista is light brown and blackish apically. Pile of face and cheeks (on the former confined to the eye margins) brown in colour. *Thorax*: the scutellum, pleura and humeri are velvety black, and almost opaque with a slight brownish cast: viewed from in front they have shining brownish-yellow pollen; the whole is covered with very long (on the scutellum exceptionally long) purplish-brown pile. *Abdomen*: black, the first segment and the fourth segment, except in the middle and on the base, more or less shining. The posterior margin of the fourth segment is reddish. The pile of the abdomen is very dense, moderately long, brownish black; on the second and third segments it is very much flattened and appressed. There are a few reddish hairs near the apex of the fourth segment. *Legs*: chiefly light brownish red; the tarsi, except the hind tarsi, are dark brown and the basal half of all of the femora is dark brown and dark brown pilose. The hind femora on the apical, lateral two-thirds and

the whole of the lateral surface of the hind tibiæ, except narrowly at the base, are thickly, long, bushy, golden-red pilose. This gives a most remarkable impression of the appearance of certain bees. The inner lateral surface of the hind femora and tibiæ have dark sooty-brown pile. The middle tibia on both surfaces has only orange pile, longer on the outer lateral surface. *Wings*: strongly tinged with yellow, the apical fifth of the wing, together with the posterior cross-vein, is pale brown. There is a small, yellow stigmal spot but no stigmal cross-vein.

*Holotype*: a male. R. Turner col. Shillong, 4.03, 1907: 22.

*Lejops rhinosa*, sp. n.

Epistoma exceptionally long; thorax dull brown with pale ochreous vittæ; the black abdomen has black and ochreous fascia. Related to *nasutus* Curran.

*Female*.—Length 11 mm to end of snout, wing 8.5 mm.

*Head*: the eyes widely separated, the distance across the middle of face scarcely wider than the distance across the vertex from the eye-margin. The pile of the vertex and front, except just before the antennæ where the front is tolerably bare, is abundant, quite long, slender, black and erect. The occiput from upper eye-corners and behind the black pile of vertex, together with the cheeks and a small area on each eye-margin on each side of antennæ, is pale yellow pilose; there are a few pale hairs and a few shorter black hairs, the latter restricted to the tip along the sides of the snout. The vertex, the narrow sides of the front, the upper sides of the face and a transverse band below the antennæ, are brownish-ochreous pubescent. The entire lower half of the front forms a dark brownish square, bordered by the narrow light eye-margins. The snout is elongate, shining black, bare on the lower and ventral margins; the remainder is sparsely covered with light yellow almost golden pubescence; the snout is much longer than in other species of *Lejops*, in fact easily as long as in the genus *Rhingia*. The antennæ are dark brown, the third joint black, about as long as wide and rounded, the arista short, basally thickened and bare. *Thorax*: very dark brown pollinose, with a pair of slender, brownish-ochreous vittæ

which are widely separated and run not quite back to the scutellum ; each is expanded on the outer lateral edge at the extreme anterior end of the mesonotum so as to reach the humeri. The three resulting dark stripes are of about equal width. The two larger ochreous vittæ are bordered on each side obscurely by narrow lines of blackish brown. The scutellum is brown, shining, the basal margin almost metallic ; its apical half is rather pale brownish yellow. Pleura blackish and shining with long, abundant, tufted, delicate, pale yellow or golden pile. The pile of mesonotum is excessively short, erect and everywhere pale ; it is longer on the calli, very long on the humeri, short over the scutellum, with a marginal row of about twelve long, shining yellow bristles. *Abdomen* : not quite twice as long as wide and widest at the end of the second segment, gradually diminishing from there ; the whole of the first segment is shining grey with slight yellowish tinge from pollen. The entire basal border of second segment, except at the extreme sides, is narrowly bordered with black. The posterior part of this segment has a transverse band of black produced forward as a very obtuse triangle until it almost touches the black of the anterior border ; posteriorly, the band reaches the sides narrowly ; the sides and middle of this segment are brownish yellow. The third segment is similarly coloured, the anterior black border absent except in the anterior corners and very narrowly in the middle. The fourth segment is wholly shining black except for an opaque rhomboid in the middle and a slightly oblique, narrow, yellowish-grey pollinose band from each side to the middle of the basal margin. The fifth segment is wholly shining black. The pile of the abdomen along all of the sides, upon the transverse pale bands and over the black areas, except in the middle posterior part of each segment, is shining yellow. The pile on the middle and posterior part of the segments past the first segment is appressed and black. Fifth segment wholly pale pilose. Only the anterior half or more of the first and second posterior black bands on the second and third segments are opaque black ; elsewhere they are shining black. *Legs* : the femora, except the narrow apex, is shining black. Tibiæ and tarsi light yellowish brown, the middles of all of the tibiæ and the

hind basitarsi dark brown. The hind femora are moderately thickened, the pile of the legs everywhere pale yellowish. The hind basitarsi is thickened and elongate, its outer lateral margin with a complete row of close-set, dark brown setæ; the hind tibiæ ends transversely. *Wings*: pale greyish brown with a strong, deep, but not acute bend in the third longitudinal vein; subcostal cell clear without stigmal spot but with a strong, thick, stigmal cross-vein.

*Holotype*. a female. Uganda Protectorate, Mpanga forest, Toro, 4800 ft. 13 23, Nov. 1911, S. A. Neave. *Paratype*: one female, same data.

*Merodon apimima*, sp. n

Related to *multifasciatus* Curran in type of femoral armament and abdominal fascia, distinct in the black front, yellow pilose vertex, brown humeri, absence of red on second abdominal segment, besides other details of pattern.

*Female*.—Length 12 mm., wing 10.5 mm.

*Head*: the very broad, tumid, rounded occiput is wholly pale greyish-white pollinose. There is a broad, median, shining black band down the long front. The pile of the occiput and of all of front and face is long bushy, shining and white, a few dark hairs lie in front of the ocelli. The antennæ are very low set upon the head; the face in consequence is very short and deeply concave with the greatest depth below the middle of the face; the light reddish-brown antennæ almost reach the epistoma. The third joint of antennæ is nearly as long as the second and darker brown, the arista is yellowish, strongly thickened on the basal half. Eyes long, sparsely pilose. There is a short, slender groove, quite tiny, before the antennæ. *Thorax*. broad, rather flat, dully shining black in the middle; it is broadly shining greyish to greenish pollinose or submetallic along the lateral margins and along the anterior margins of the mesonotum, and again transversely before the scutellum. The scutellum is large and exceedingly broad, its margin or rim is impressed, is yellowish brown and with a thick, marginal rim of bushy, yellowish pile directed towards the mid-line all along the margin. The pile of the scutellum is thick, yellow and erect. The pile of the



dorsum is similarly coloured, a little shorter and a little bit more directed posteriorly; pile of the mesopleura and pteropleura long, thick, bristly and whitish. *Abdomen*: broader than the thorax, half again as long as wide, the sides of the second and third segments are almost parallel and scarcely beginning to narrow before the middle of the third segment. The ground-colour of the abdomen is shining blackish with many slender, transverse bands of greyish white to orange or deep yellow pollen. The second segment across the middle has a slender band of greyish pollen near each lateral margin, curving very slightly forward and at the same time a little widened so that the anterior margin of the band, before it reaches the sides, is convex. The entire posterior margin has a very slender, yellowish-grey band that is continuous laterally with the posterior corners of the middle band, which actually fails to reach the true margin of the segments. The third segment has a broader, middle band of brownish-yellow pollen and a posterior band of the same colour. The fourth segment has a similar middle band, wider, slightly diagonal on each side instead of transverse, and with a similar posterior band. Pile of abdomen quite abundant and flat-appressed, greyish or whitish on the anterior half of the abdomen, becoming golden-orange on the third, fourth and fifth segments and a little more prominent on the transverse pollinose bands. In consequence, these transverse bands appear to be brilliant, golden-orange. *Legs*: entirely pale pilose, all of the femora are dark brownish-black, shining, the anterior pair with full-length brushes of bushy, whitish, shining pile on the posterior surfaces. The hind femora are considerably thickened on the dorsal half throughout their length, their pile is flat, long, thick and yellowish. There is a strong reddish spur or spine before the apex of the hind femora; hind tibiæ much thickened and flattened, slightly curved, light reddish brown with a dark brown area in the middle. The fore and mid-tibiæ are similarly coloured. All of the tarsi are light red. *Wings*: light brown in colour, the veins light brown; there is a deep, somewhat oblique, outwardly-directed, perfectly rounded loop into the third longitudinal vein; last section of the subapical cross-vein strongly recurrent, except just before its end. The

costa ends at the end of the third longitudinal vein ; there is a strong stigmal cross-vein.

*Males*.—Eyes holoptic, touching for a distance almost as long as the vertical triangle. Face as deeply concave as in the female. Hind femora, tibiae and wings the same as in the female.

*Holotype* : a male from Mlange, Nyasaland, 2-21. iv-vi. 1913, S. A. Neave, presented by the Imperial Bureau of Entomology, 1915 : 165. *Allotype* : a female, and five male and five female *paratypes*, all of the same data.

*Merodon bombiformis*, sp. n.

Distinguished from other African species by the large size and the very small wings as well as by the barely projecting front ; apparently not closely related to other species from this continent.

*Male*.—Length 17 mm. ; wing 11.5 mm.

*Head* : the occiput is tumid, dark reddish brown, reddish pilose ; the vertex is shining blackish and orange-red pilose. The entire front and the very short face are light red in colour with thick, bushy, shining, reddish pile with a golden tinge. The antennae are short, reddish in colour, the second joint blackish ; arista orange, very slender and thickened at the extreme base. Eyes rather thickly pilose. The face retreats below the antennae, is more or less straight in profile, the front part of the epistomal margin projects out a little way, leaving a slight facial concavity. *Thorax*. dark blackish in the centre, continued past the anterior margin more narrowly as a stripe of the same colour. The broad lateral margins and the humeri and the post-calli are light, orange-reddish brown with similarly coloured pile. The scutellum is very broad, dully shining, dark brown, the rim emarginate, paler in colour, with bushy, orange pile that is directed inward ; pleura blackish and shining with some greyish pollen. The pile of the entire thorax and pleura and scutellum is thick and orange. *Abdomen* : very broad and thick, wider than the thorax and curving downward somewhat posteriorly but quite flattened on the first two segments and the base of the third. The first segment, except its extreme corners and a broad basal band on the second segment, which occupies only

the middle half of the segment and is continued narrowly in the middle to the apex of the segment, is black in colour; elsewhere the first and second segments are light, brownish orange with thick shining pile of the same colour; the third segment has a broad, basal, continuous band, brownish black; the remainder of that segment orange-brown, golden-red pilose, except for a median subapical obscure brown spot. The fourth segment is similarly coloured and banded. The obscure median brown spot is larger, triangular, with equilateral edges, the apex forward. *Legs*: femora shining black, the anterior pair grey pollinose, the hind femora moderately thickened, with a very strong, sharp, black, subapical spine. All of the tibiæ are yellowish on a third or less, blackish apically; tarsi blackish brown. *Wings*: small and apparently very inadequate. The extreme base and costal and subcostal cells and the auxiliary and first longitudinal veins yellow; elsewhere wings grey with brown veins. There is a strong loop somewhat obliquely directed into the first posterior cell. It is without spur. Last section of the subapical cross-vein strongly recurrent. There is a strong stigmal cross-vein.

*Holotype*: a male. South Africa; Distant collection, 1911: 383, with additional illegible writing: 27-12-98.

*Merodonoides minutus*, sp. n.

Separated from *circularis* Curran by the absence of fascia upon the posterior portion of the third and fourth abdominal segments, the wholly reddish hind femora, the smaller size and different eye-pattern.

*Male*.—Length 8 mm.; wing 6 mm.

*Head*: the eyes are almost touching and are thrust angularly toward the mid-line, about half-way between the antennæ and the ocelli; the upper part of the front and vertex is blackish with some grey-yellow pubescence in some lights; the pile of this area is thick, quite erect and black; pile of the occiput pale in colour with a yellow-grey pubescent ground-colour. The lower part of the front and face and cheeks is shining black in ground-colour, almost completely obscured on the front and opposite the antennæ, and to a less extent upon the sides of the face by pale, golden pubescence. The low facial tubercle is bare. The first and second joints of the

antennæ are blackish brown, the third joint grey-brown, slightly reddish beneath; arista light brown. The eyes have four conspicuous brown stripes which form a continuous and widening line towards the vertex, but the anterior three stripes of which are ventrally broken up in spots; the first stripe is about the middle of the eyes, and the second and third stripes near the cheeks. The first stripe is confluent with the anterior margin of the eyes, the fourth continuous with the posterior margin. The first and second stripes are confluent just above the antennæ; the third and fourth ones confluent opposite the ocelli. *Thorax*: with four conspicuous, rather wide, black stripes that are not quite confluent at their posterior apices, the outer pair are pointed posteriorly, the inner pair broadly truncate; the four are separated by three almost equal areas and the outer pair laterally margined by opaque, greyish-yellow pubescence. The scutellum is wholly, dully shining, orange-brown. *Abdomen*: broad and but little less narrow apically; the first segment is wholly pale greyish pubescent; the second segment is almost wholly a beautiful light orange, its base narrowly, almost to the extreme anterior corners, opaque black. The third segment is coloured as the second, a little darker or more brownish on the apical half; its extreme posterior margin is yellowish; the fourth segment is dark shining brown, its posterior border light yellow; the large and broad hypopygium is dark shining brown. The pile of the abdomen is everywhere pale shining yellowish, erect on the first three segments, appressed on the fourth. *Legs*: the fore and mid-femora except for narrow brown apices are black with grey pubescence and white pile. The posterior femora are considerably thickened, chiefly so on the basal half; they are light orange brown on the lateral outer surface, barely becoming darker at the apex but on the inner surface they have a brownish black, narrow annulus just past the middle and the apex is broadly similarly coloured. The hind tibiæ are thickened, definitely arcuate, dark brownish, with ventrally, a knife-edge on the basal half. The anterior tibiæ are reddish basally, blackish apically, its tarsi blackish, the middle tibiæ are pale yellow on the basal two-thirds, almost white and barely darker apically; the first two tarsal joints are pale yellow, the others brown or

black. *Wings* : hyaline, glassy, without villi ; the stigma is three times as long as wide and dark brown ; remainder of stigmal cell clear, marginal cell closed, its apex broadly and horizontally bulbous.

*Holotype* : a male. Central India, Jubblepore, Nov. 15, 1907, ex col. Brunetti. 1927 : 184.

*Eristalis stigmaticus*, sp. n.

Related to *langi* Curran, the scutellum is narrowly black at the base ; there is a prominent, acute, opaque black triangle upon the front in addition to the upper transverse band ; the small elongate, stigmal spot is dark brown.

*Female*.—Length 9 mm. ; wing 8 mm.

*Head* : hemispherical and but little wider than the thorax, the upper part of the occiput is opaque black except for a marginal line of white pubescence along the posterior eye-margin. The vertex across the ocelli and immediately in front is shining bluish-slate coloured black. The front is shining black and there is a broad, transverse, opaque black band across the upper part of the front connected with a similarly coloured, median, acute triangle, whose base lies anteriorward and touches a small, convex, shining black spot above the antennæ. Immediately above the antennæ there are a pair of shining, brownish, connected, flattened areas. The antennæ are light brown in colour. The pile of the first and second joints is black ; arista missing. The face and tubercle are broadly shining black in the middle. The sides of the face, broadly to the margins of the eyes and narrowly continued past and above the antennæ as a thin line reaching as far as the transverse black band of the front, are silver pubescent. The cheeks are shining black. The lower portion of the occiput is whitish with white pile. *Thorax* : opaque black with a complete, distinct, ash-grey or slate-blue band anterior to the dorsal suture, which band at the extreme margins of the thorax becomes brownish grey. On the posterior half of the thorax there are four diagonal, slightly oval spots, the inner pair have their anterior ends nearest the outer pair with the posterior ends nearer. The scutellum is pale, opaque yellow and very narrowly blackish along its extreme base ; its pile is long, sparse, chiefly pale, but

with several black hairs on the margin and a few towards the base. *Abdomen*: a little longer than wide, almost wholly black, the first segment is grey pollinose, the second opaque black, with on either side a rather small, widely separated, obscure reddish spot which is part of a more extensive bluish-grey or black triangle that reaches broadly to the lateral margins. The third segment is opaque black, with a narrow, metallic fascia or band across the middle of the segment that shows traces of interruption in the middle and is expanded slightly posteriorly and more anteriorward as it reaches the lateral margin. There is a similar metallic band before the middle of the fourth segment, expanded to cover the entire lateral margin and similarly with traces of interruption in the middle. The fifth segment has a similar metallic band across the middle, which bears some indication of having been broken up into three or four spots. *Legs*: femora, except for the narrow apices, shining black; the hinder pair is considerably thickened, the thickening greatest in the middle and evenly spread out. The fore and middle tibiae are light brownish yellow on their basal third or more; the hind tibiae are reddish brown basally. All of the tibiae distally and the tarsi are dark brown. Hind tibiae not produced at apex, definitely arcuate and without any special fringe or pile. *Wings*: lightly tinged with brown. the marginal cell is narrowly closed, the loop of the third vein is not especially deep, the stigma is four times as long as wide and very dark brown.

*Holotype*: a female. South America, Colombia, Atrato Valley, June 1914, Dr. A. Balfour, 1915: 298

*Eristalis luciliomima*, sp. n.

Distinguished by the blackish vittate mesonotum, bare arista and yellow face, yellow pubescent, from *smaragdi* Walker; the species is larger and the venter is metallic green.

*Male*.—Length 10 mm.; wing 9 mm.

*Head*: barely wider than the thorax and hemispherical, the eyes exceedingly large and touching for a very long distance; the facets upon the upper three-fifths of the eye are enormously enlarged and this area much flattened; the vertex is quite small and limited to the large and

*some lines of the Fa*

bulging ocelli which almost touch the eye-margin, pile of this region black. The front, face and cheeks a light, subtranslucent, brownish yellow, the tubercle, the area narrowly above it, the cheeks and the area below the tubercle to the mouth, and the whole of the oral margin are bare. The remainder of the face and broad along the eye-margins beneath the antennæ is pale golden pubescent. The front is bare with pale pile among which are four or five black hairs intermixed. The antennæ are wholly light brownish orange, the arista is brownish, quite long and with some barely discernible microscopic, basal pubescence. *Thorax*: dorsum of thorax and the whole scutellum shining, brilliant green with a bluish cast along the sides and a slight golden tint in the mid-line beginning at the anterior margin. In mid-line, viewed in the right light, there is a conspicuous pair of pale brownish, pollinose vittæ, narrowly separated and reaching only a short distance past the median suture. On either side of this in the region corresponding to the golden cast one may see from the right posterior traces of a second pair of vittæ represented by obscurely triangular, posteriorly-pointed spot before behind the suture. The pleura are bright metallic green. The pile of the dorsum is chiefly black behind the suture and largely pale in front of it. The spiracles of thorax are extremely large, two or three times normal size. The anterior one is bright egg-yellow, the posterior one black. The squamæ are extremely large with the fringe blackish on the greater part, not pale on the base; halteres orange; the scutellum extremely large, without impressed rim. *Abdomen*: broader than long, almost wholly brilliant, shining with a bluish cast in some lights and a golden on the posterior margin. In the middle of the second segment, its apex reaching the anterior margin, the equilateral triangle of opaque black. On the second third segment on either side there are transverse, depressed areas. The pile of the abdomen on the half of the segment is chiefly pale; on the posterior it is more or less confined to the middle and is black. *Legs*: femora blackish with a dull, greenish cast, apices narrowly brown, the hind femora quite black, although twice as thick basally as on the apical

gradually tapering; their pile is entirely pale except for one or four scant, short, ventral, terminal black bristles. The tibiae are quite slender, basally yellowish brown and darker apically, the pale area narrow upon the hind pair, the first dark brown. *Wings*: glassy hyaline, devoid of veins, the stigma lengthened out to occupy the basal one-fifths of stigmal cell; a stigmal cross-vein present. *Holotype*: a male. New Hebrides, Banks Island, Santa Maria, Id., (Gaua Nombur, T. T. Barnard, 1922-4) 1923: 371.

*Eristalis muscomma*, sp. n.

Related to *resolutus* Walker, but with clear wings; greenish-black flies with opaque black vittae.

*Male*.—Length 11 mm.; wing 9 mm.

*ad.* hemispherical and barely wider than the thorax, eyes are large, touching for considerable distance, the first one-fourth of the facets considerably enlarged and the area flattened. The vertical triangle is small, the sides almost touch the eyes; this area is black and the convex front and face and cheeks are largely shining black. The face on the upper half has a strong golden tinge. The tubercle is quite small and the face in profile below the antennae is barely concave. There is a downward-pointed wedge of silver pubescence that becomes sharply pointed near the oral margin, which it almost reaches; it is expanded above to cover most of the eye along the face. The upper part of the face has faint, transverse striae. The antennae are light brown, the arista basally of the same colour, slender distally, bare and rather long and slender. The body: shining greenish black, with a slight purplish tinge in places. In sharp contrast, in some lights, there is a pair of median vittae so close as to be practically single; they continue past the suture, but end well before the scutellum; their outer posterior ends are sharply pointed. On either side, well separated from the pair of stripes, there is a pair of irregular, tri-angulated spots before the suture and a longer, more acutely triangular pair behind the suture which has a sharper point and reach closer to the scutellum than the median pair of vittae. The scutellum is very dark shining greenish black, without impressed rim



and thickly short black setate. Pleura metallic upon the meso- and upper sterno- and pteropleura. The spiracles are large and brownish black. *Abdomen*: widely shining reddish bronze or coppery, more golden on the sides, greenish on the basal corners of the second segment. The second segment is opaque black upon the basal margin and upon a wider, pre-apical, slightly arcuate, transverse fascia, which is connected in the middle to the posterior margin. The third segment has opaque black spots as follows:—an oval, median spot not quite reaching the base and still less reaching the apex, but pointed apically, and on either side there is an oblique, slightly arcuate spot or obtuse triangle, the apex of which almost reaches the apical margin but fails by a greater degree to reach the lateral corners. The fourth segment is similarly marked, but none of the spots are pointed; the outer diagonal pair is oval instead of triangular and subarcuate. The pile of the abdomen is chiefly black, appressed, setate. *Legs*: the femora are all black except the narrow apices; the hinder pair are but little thickened, but that thickening is spread out uniformly and only the apical fifth or sixth considerably tapering. All of the tibiæ are brownish and darker apically, paler basally, the middle pair are more extensively pale, the hind pair narrowly pale. The hind tibiæ are barely arcuate and sparse, golden pilose. Pile of hind femora pale golden, with numerous black setæ apico-ventrally. Tarsi dark brown. *Wings*: inconspicuously tinged with brown, especially on the apical border. The stigma occupies the basal two-thirds of the stigmal cell.

*Female*.—The front of the female has a median, black vitta beginning some distance above the antennæ and becoming a little wider on the upper part; upon the abdomen the lateral spots of the third segment are less triangular and pointed and are more arcuate. The median spot of this segment is broader and is not pointed. The median spot of the fourth segment is quite round and touches the base.

*Holotype*: a male, and one *paratype* male, from New Hebrides, Banks Island, Santa Maria, Id., Gaua Nombur, 7.10.1922, T. T. Barnard, 1923: 371, also same data but Nov. 8, 1922; there is an *allotype* female from New Hebrides, Pentecost Island, Lamalanga, Sept. 27, 1922, T. T. Barnard, 1923: 271.

*Baccha vivida*, sp. n.

Abdomen brilliant, shining blue; violaceous upon the second segment; legs light brown; wings anteriorly bordered with brown. Related to *purpuricola* Walker.

*Female*.—Length 13 mm.; wing 10.5 mm.

*Head*: the vertex, occiput, front, face and cheeks are everywhere brilliant, shining blue. The eyes are rather narrowly separated and three to four times as wide at base of antennæ as at vertex. The front is slightly depressed a short distance above the antennæ and the face at oral margin is barely narrower than across the antennæ. The prominent facial tubercle is blunt and not sharply descending either above or below. The pile of the vertex is extremely sparse, together with that of front and face white in colour. The upper occipital collar just behind the ocelli is black or brown. Remainder of occipital collar single-rowed and white and not scaly. The basal antennal joints are brown; the third joint is wholly orange, about as long as the other two. *Thorax*: very convex, together with the scutellum except at its extreme margin, the calli and the humeri, wholly brilliant, shining blue and short, sparse pilose. The anterior collar of pile, the pile of the very convex scutellum and of the posterior third of the mesonotum, is whitish; elsewhere it is black. The squamæ are white, white-fringed. *Abdomen*: wholly brilliant shining blue; only the middle and sides of the second segment are violet in colour. The second segment is quite narrow and very cylindrical; it is five or six times as long as wide, barely wider posteriorly in the middle, expanding, beginning at the third segment into a very broad, flattened, oval shape that is widest in the middle of the fourth segment, hence spatulate distally, and quite thin and much flattened. The pile of the abdomen on all of the third and fourth segments, and upon the middle of the second segment, except narrowly along the anterior corners, is appressed, black setaceous. On the sides of the first and second segment there is the usual long, pale, sparse pile. *Legs*: wholly light brown, the distal third of the hind tibiæ and the hind basitarsi alone are dark brown. Pile of legs, except on the dark brown area pale in colour. *Wings*: with a strong, dark brown anterior border. Basally it covers the first and second basal cells

and in the middle of the wing forms a large more or less rounded dark brown spot, reaching narrowly to the posterior margin of the wing.

*Holotype*: a female. Dutch East Indies, Timor, vi. 1929; purchased E. Le Moulton, 1933: 189.

*Syrphus flavigaster*, sp. n.

Unlike any described species from this region. The species is characterized by the light yellow abdomen and the narrow, scanty, linear fascia of black upon the base and apex of the second to fourth abdominal segments.

*Male*.—Length 11.5 mm.; wing 8.5 mm.

*Head*: hemispherical, the eyes touching for considerable distance, the anterior facets enlarged, the vertical triangle black and small with a linear wedge of anteriorly-directed black pile. The front, except for a prominent, diffuse black spot above the antennæ is pale yellow and yellow pollinose with long black pile along each eye margin and along the upper part of the front; the black is therefore bare. The face has a well-developed, obtuse, large tubercle; it is barely concave between tubercle and antennæ and below the tubercle the face strongly retreats to the oral margin. The face and cheeks are everywhere pale yellow; the tubercle is slightly brownish; except for the tubercle and cheeks, the face is densely shining, yellow pubescent. The first and second joints of the antenna are pale, orange-yellow, black setate; third joint missing. The lower part of the occiput is golden scabrous, pilose, with many rows of hair. *Thorax*: the mesonotum, except for a very broad, lateral margin is wholly greenish and shining; it is somewhat obscured by greenish to yellow pollen; there is a mid-mesonotal line, dark in colour like that found on *Mesogramma*. The pleura and the margins of the mesonotum are yellow in colour and densely golden pollinose with long, golden pile; humeri yellow and bare; squamæ and plumula pale yellow with golden fringe; posterior calli shining yellowish, yellow pilose. The scutellum is wholly pale, clear opaque yellow, its pile wholly black, longer on the margins and rather abundant. *Abdomen*: oval, twice as long as wide and very flat; it is light yellow in colour, with light to dark brown bands. In the middle of the second segment there is a slender transverse band, its posterior margin

slightly curved, and neither side reaches the lateral margin of the segment, the ends of the band are pointed and connected in the middle and front with the base of the segment by a median brown vittæ. There is a slender, posterior band on the second segment, narrowly separated from the hind margin, it barely reaches the sides of this segment; there are similar bands on the third and fourth segment. that upon the third segment is slightly oblique, leaving more yellow colour posteriorly and in the middle. On the anterior margin of the third and fourth segments, narrowly separated in the middle from the actual base and more widely separated at the sides of these segments, is a slender, brown, transverse band, which upon the fourth segment shows some tendency to be broken up into three brown spots, a median and two lateral ones. The fifth segment is yellow with a median wedge in the middle, a tiny basal median spot and two slender, sublateral brown wedges. The pile of the abdomen is everywhere delicate, black, sparse but long, thick yellow pilose on the sides and margins of first and basal half of second segment. There is a row of black bristles on the submedian posterior margins of the first segment. *Legs*: pale yellow to orange, the hind tibiæ and tarsi dark in colour. The pile of the hind femora, except the base, the hind tibiæ and four or five bristles at the tip of the middle femora are black; elsewhere pale. *Wings*: pale brown, barely darker along the outer anterior margin to the end of costa. Subcostal cell brown; third longitudinal vein very slightly curved.

*Holotype*: a male Amazons, H. W. Bates, 66: 53.

*Xanthogrammu nigripilosu*, sp. n.

Related to *javani* Wiedemann. Scutellum opaque yellow with a large, black semicircle; mid-front and mid-facial stripe black; abdomen black with bright yellow fascia.

*Male*.—Length 10 mm., wing 8 mm.

*Head*: eyes touching for a distance less than the length of the front or almost equal to it; the eyes are bare, the vertical triangle is somewhat raised, metallic brassy with a narrow, longitudinal, compressed wedge of black pile forward directed. The occiput above is black pilose without upper margin because of the encroachment

of the eyes. The eyes are somewhat incised posteriorly in the middle; the lower two-thirds of the occiput is silvery, scalose pilose. The front, face, cheeks, the latter brownish next to the eyes and separated from the anterior part by a deep crease, are wholly light yellow and shining, with a large, prominent black spot above the antennæ, and beginning immediately below the antennæ there is a wide median black stripe, less wide at the oral margin. The facial tubercle is very prominent, forming a strong outward bulge. The face is concave below the antennæ; pile of face whitish, of the front along the margins long and black. The central black spot of the front is bare. Antennæ short, brownish, the third joint orange below and as long as the first two joints. The arista is short, barely longer than the antennæ, basally thickened and brown. *Thorax* dorsum of thorax brilliant, shining brassy with a broad, continuous, lateral, yellow stripe covering the posterior calli and reaching the scutellum. Pleura shining brassy, humeri, the whole posterior, the upper part of the sternopleura, the middle part of the pteropleura, part of the mesopleura, the propleura, and the whole of the metapleura yellow. Scutellum wholly opaque with a broad basal band connecting with a still more broad margin, bright yellow. The central part is a large black semicircle. Pile of the dorsum of the thorax everywhere erect and wholly black except upon the pleuræ, on the anterior parts of the lateral yellow stripes, again very narrowly on the anterior part of the mesonotum; on the posterior calli, on the disc and the margin of the scutellum, the pile is rather dense, long and black. *Abdomen*: broad, widest on the third segment, barely narrower at the base of the second and the end of the fourth. The fifth segment is somewhat less than an equilateral triangle. Anterior corners of the first segment widely shining yellow. There is a central black spot in the middle of the first segment and another on either side black. The second segment has a widely separated, opaque, light yellow, transverse spot, pointed medially, reaching the margin in full width; the remainder of the segment is wholly opaque black, except for a narrow apical band, narrow anterior basal corners and small basal spot in the middle. The third segment is similarly opaque black, except for lacking middle basal

spot, and has an anterior yellow transverse band that is not interrupted or incised, is slightly wider just before it reaches the lateral margin, is transverse across the middle of the segment, is slightly oblique on each side, and is directed posteriorly. Fourth segment with exactly similar bands, similarly opaque black; the metallic areas are as in the preceding segment, the posterior metallic band a little wider. Fifth segment similar but with a pair of widely-separated oblique spots narrowly reaching the lateral margins. The pile of the abdomen is everywhere black, except on the yellow portion of the first segment and the inner portion of the yellow spots of the second segment, which is yellow. *Legs*: the fore and middle tibiae and femora and the basal half of the hind femur are wholly pale orange. The pile of the anterior tibiae and a lateral row of long hairs on the apical two-thirds of the anterior femora, together with a similar row on the apical half of the middle tibiae are black; elsewhere it is pale. Fore and mid-tarsi light brown and hind tarsi dark brown; the apical half of the posterior femora and the whole of their tibiae blackish and blackish pilose. *Wings*: pale brown throughout, the stigmal cell dark brown, the spurious vein well developed; squamæ blackish, black-fringed.

*Holotype*: a male. *Paratypes*: eight males. All are from the Society Islands, Tahiti, 29. v. 25 to 5. v. 25, L. E. Cheesman, 1925: 464.

*Chrysogaster africana*, sp. n.

Near *pæcilops* Bezzi, the wings have a faint brown cloud in the middle; eyes unspotted.

*Male*.—Length 6.5 mm.; wing 4.5 mm.

*Head*: the eyes touch for a distance equal the length of the vertical triangle; the latter is shining black and faintly transversely striate and with perhaps a bluish cast. The front is large with a slightly inflated appearance and with well-developed median depression that runs almost the entire length; there is a short, distinct, transverse depression above the antennæ and in general the colour is shining black. The frontal pile is long, but of about equal length throughout and wholly white. The face is shining metallic black, the tubercle small, the epistoma a little more prominent than the tubercle,

and the concavity above and below the tubercle is about equal. On either side of the face, connected below the antennæ, is a micro-granulate, large, roughly pentagonal spot or area which is moreover diagonally grooved or striate. The antennæ are short, the first two joints are dark brown, the third reddish brown and but little longer than wide. The arista is strongly thickened basally and dark brown. The eyes are quite sparsely pilose on the upper half. *Thorax*: convex, together with the scutellum wholly, bright, brassy or golden-brown in colour. There are a pair of median, well separated, very faint vittæ ending a short distance past the suture, and traces of somewhat longer, more lateral vittæ, which are the same colour and are very faintly discernible because they are more opaque. The thorax might almost be considered non-vittate. Margin of scutellum evenly rounded, with a very distinct though quite shallow marginal groove. The scutellum is somewhat more shining than the thorax, due possibly to golden pollen. *Abdomen*: elongate, longer than the thorax, quite flat and dull blackish except on the sides of the segments; there is a faint, milky-bluish cast and many slender transverse lines, not striate, but visible because they are more shining. Sides of all of the segments, more extensively on the third and quite widely on the fourth, as well as the posterior margin of the fourth, bright brassy or golden-brown. Pile of abdomen pale with some dark, very short hair in the middle of the segments. *Legs*: wholly dark, the femora and tibiæ more or less seneous, the tarsi blackish. The hind femora is but little thickened, is without ventro-apical pines, the basitarsi are not noticeably enlarged. *Wings*: brownish tinged with a faint brown cloud near the middle; the stigma is pale brown; the vena spuria is a much abbreviated brown fold not in the least chitinated; the subapical cross-vein ends rectangularly, with a strong outward curve about its middle and a well-developed spur.

*Holotype*: a male. East Cape Province, Katberg, 4000 ft., Oct. 1932, South Africa, R. E. Turner, 1932: 521.

*Chrysogaster pilocapita*, sp. n.

Wings unspotted. Mesonotum and scutellum shining golden-brown; legs black, antennæ short, the last joints

brownish orange; related to *pæcilops* Bezzi, but the eyes are unspotted, mesonotum not pilose vittate.

*Male*.—Length 7.5; wing 5.3 mm.

*Head*: the eyes touch for a distance rather greater than the length of the vertical triangle; vertical triangle shining blackish with some pale and some dark hairs. The front is quite large with a prominent, median groove extending more than half of its length and with a lunate depression above the antennæ, its pile long, abundant, wholly whitish and twice as long on the upper part of the front as upon the lower half; the general colour of the front as well as of the face is shining metallic black with perhaps a faint bluish cast. The face has the tubercle almost absent and the epistoma scarcely evident and barely more prominent than the very shallow tubercle. On either side of the face, connected below the antennæ, is a large, triangular, microstriate area with transverse instead of diagonal ripple marks; pile of face pale. The antennæ are short, the first joint is very dark, the second and third are light brownish orange; the third joint is barely longer than wide, the arista darker, basally thickened. *Thorax*: together with the scutellum bright shining æneous or golden-brown with, in the middle and before the scutellum, a ruddy cast, and along the extreme anterior side of the mesonotum the metallic colour is more whitish and less yellowish. In the middle there are very faint traces of less shining vittæ paler in colour against a ruddy background. This is confined to the anterior half of the thorax, which might be considered non-vittate. Scutellum evenly rounded, without any trace of marginal groove. Pile of scutellum and thorax erect, rather long, and pale whitish. The squamæ are whitish, the fringe whitish and the margin narrowly brown; halteres blackish. *Abdomen*: elongate, a little longer than the thorax, dull black to brownish black on the disk, the sides of the segments are shining æneous-brown, which is more extensive on the fourth segment. *Legs*: wholly dark, the tibiæ and femora are shining black, but without pronounced metallic cast. *Tarsi* black. Hind femora but little thickened, with no spinous setæ apically. *Wings*: faintly brownish; the vena spuria is short and brownish. The stigmal cell is brownish yellow, the subapical cross-vein ends rectangu-



larly, but its basal or posterior two-thirds is strongly turned backward so that this section almost parallels the wing margin; it is without spur.

*Holotype*: a male. Ceres, Cape Province, Nov. 1920, South Africa, R. E. Turner, 1920: 497.

*Chrysogaster proserpina*, sp. n.

Related to *pilocapita*, the face is bluish black; there is a definite impressed margin upon the scutellum, etc.

*Male*.—Length 6.3 mm.; wing 4.6 mm.

*Head*: vertex shining blackish with pale pile; the eyes touch for a considerable distance greater than the length of the vertex; the front is moderately large, but little swollen and together with the face shining bluish black, almost steel-blue. The pile of both face and front is pale. Face with a large, subquadrate area on either side, microstriate, transversely grooved or rippled and connected beneath the antennæ. The facial tubercle is practically absent. The epistoma is barely more prominent than the tubercle. There is a mere trace of concavity above and below the tubercle and in this respect the species is close to *pilocapita*, differing chiefly in the more bluish face and the presence of a definite, impressed margin upon the scutellum and the presence of a well-developed spur from the lower corner of the subapical cross-vein. Antennæ, first joint brown, second and third light brownish orange, the third joint is a little longer than wide and apparently definitely longer than *pilocapita*. Arista basally thickened, light brown. *Thorax*: shining æneous or metallic brassy, becoming more whitish along the sides. There are only very faint traces of vittæ. The thorax may be described as being practically non-vittate. Scutellum concolourous, evenly rounded, with a white, definite, broad, but shallow impressed groove before the margin on the apical third. Squamæ pale brownish white, the halteres blackish brown. *Abdomen*: elongate, not greatly longer than thorax and scutellum together, dull blackish brown upon the disc, with a steel-bluish cast on the terminal half except where it is metallic brassy. The opaque portion has faint, transverse ripples. The sides of the abdomen, more extensively on the fourth segment, together with the hypopygium, are brilliant metallic brassy. The pile of

the abdomen is chiefly pale with some microscopic black hairs on the opaque middles of the segments. *Legs* : entirely black or blackish brown ; the femora and tibiæ are somewhat metallic ; the hind femora are very little thickened and without subapical setæ, the basitarsi not noticeably enlarged. *Wings* : pale brownish, the stigmal cell brownish yellow, the vena spuria a mere abbreviated brownish fold. The subapical cross-vein joins the quite straight third longitudinal vein at right angles ; its basal three-fifths is strongly oblique with a well-developed spur.

*Female*.—These specimens, which I assume to be females of this species, seem to be similar, their eyes are similarly pilose, the pile being very sparse and whitish, the antennæ are a little darker brown, narrowly blackish brown along the dorsal edge of the third joint. The principal difference is the total absence, as is expected, of the tubercle, the face being shallowly concave in consequence. The front is very broad and the eyes are widely separated and there are a series of distinct but shallow and transverse, slightly arcuate grooves, that are quite punctate, across the middle of the front. The two females are slightly different in regard to the rugosity of the front and of the face.

*Holotype* : a male. Ceres, Cape Province, Nov. 1920, R. E. Turner, 1920 : 1497. *Allotype* : a female, and a *paratype* female with the same data and a second *paratype* female East Cape Province, Katberg, 4000 ft., Oct. 1932, South Africa, R. E. Turner, 1932 : 521.

*Sphærophoria retrocurva*, sp. n.

Unrelated to known African species, the quite slender, the centrally attenuated, cylindrical abdomen is black with small obscure spots.

*Male*.—Length 9 mm. ; wings 6 mm.

*Head* : the vertex, the upper occiput and front below the ocelli and above the contiguity of the eye are shining black, somewhat convex and black pilose. The front above the antennæ and the whole of the face and cheeks are pale shining yellow, pale pilose. The facial tubercle is small and the face barely concave beneath antennæ. The first two joints of the antennæ are pale yellow, the third orange and conspicuously greyish brown on the

dorsal half; the joints are slightly flattened dorsally; the short arista brownish and strongly thickened basally; the apical, dorsal pile of the first and second joints is black. Eyes bare; upper facets barely enlarged. *Thorax*: shining bronze in colour with a definite reddish or coppery tint. The humeri, a stripe along the sides of the mesonotum only as far as the transverse suture, but confluent with a spot on the mesopleura and together with the metapleura, are pale lemon yellow. Halteres orange. The scutellum is reddish brown, shining, obtusely triangular in shape, with faint transverse striae. *Abdomen*: elongate, quite slender and remarkably curved into a rounded, pipe-like structure; the tergites actually meeting ventro-basally on the third segment and almost meeting throughout the length of the second segment. The abdomen is shining vitreous and blackish; there is a diagonal, lateral, widely-separated, obscure, reddish elongate spot anterior to the middle of the third segment, and a similar, smaller, slenderer, more obscure spot on the second segment. The fourth segment is wholly shining brownish black, lighter on the sides. The pile of the abdomen is largely pale on the sides, blackish bristly and short along the middle of the segments; the pile everywhere is sparse. The segment terminates to the right in a slightly produced and curved flap; the hypopygium is rounded but inconspicuous and tolerably small. The abdomen is narrowest near the base of the third segment and at most half again wider at the apex of the abdomen; the apex is no wider than the base of the first segment. *Legs*: the coxæ and trochanters are pale yellow, the femora, tibiæ and tarsi light brown, the tibiæ paler, the hind tibiæ with an obscure subapical band of brown; the tarsi barely darker. *Wings*: quite hyaline, iridescent and villose; the entire stigmal cell beyond the region of the stigma is dark brown; the subapical cross-vein is sinuous.

In some specimens the femora are chiefly yellow on the ventral half and brown dorsally; the hind tibiæ are definitely brown on the basal and apical thirds but broadly yellow in the middle.

*Holotype*: a male, from South Africa, R. E. Turner, 1922: 129, Mossel Bay, Cape Province, March 1-13, 1922; *paratypes*: two males from same locality in October 1921,

Turner, 1921:450; and Turner, 1920:497, Ceres, Cape Province, Nov. 1920.

*Syritta maritima*, sp. n.

Distinguished from *oceanica* Macquart by the quite anteriorly-produced epistoma.

*Female*.—Length 10 mm.; wings 7 mm.

*Head*: hemispherical and but little wider than the thorax; the vertex and occiput behind the ocelli are shining black, the black area is sharply delimited from the pale yellow pollinose area of the front. The front is pale yellow pollinose with a brownish area on either side near the top, and with a fine median line that is wider on the upper part of the front. The pollinose area of the front is broken by tiny black specks where the long pale shining pile is situated. Viewed from in front the entire upper part of the front appears to be brown pollinose; it is bare and shining on a triangle just above the antennæ. The cheeks are shining black, the face wholly whitish pubescent with shining white pile along the eye-margins; the face is narrowly shining black on a stripe just above the epistoma in the mid-line of the face; it is very strongly produced forward, somewhat truncate carinate about the epistoma, and the profile is strongly curved from epistoma to antennæ. The antennæ are light yellowish brown and the arista similarly coloured. The occiput is pale yellowish pubescent with sparse, short black setæ, and its ventral and vertical pile is pale yellowish white. There are a few black hairs about the ocelli. *Thorax*: the dorsum of the thorax is shining, brownish black, with the humeri and a broad, lateral stripe as far as the transverse suture, and a narrow diagonal stripe margining the posterior calli but not quite meeting in the middle, and an obscure, anterior, very narrowly-separated vitta, that becomes obsolescent after a short distance, all thickly brownish yellow pollinose. The scutellum is wholly shining black and black pilose with a prominent, impressed rim or margin. The whole of the mesopleura, sternopleura and upper pteropleura are greyish white pollinose; their pile pale and sparse. *Abdomen*: the second segment is basally and posteriorly black and feebly shining, broadly connected in the middle; the sides of this segment have a broad, light brownish-yellow spot which includes the anterior corners and the extreme

posterior marginal corners. The first segment is grey pollinose on the sides and broadly blackish through the middle. The third segment has a conspicuous, obtuse, transverse triangle of shining black just before the apical margin of the segment, not quite reaching the sides but expanded in the middle into a broad, anteriorly-produced area that almost reaches the anterior margin. The whole of the fourth segment, except for a very narrow posterior margin, is shining black. The sides of the abdomen are emarginate. *Legs* : the basal half or more of the anterior femora are brownish black ; their apices and the basal third of the tibiæ are brownish yellow ; the distal portion of the tibiæ is somewhat lighter in the middle ; tarsi brownish. The hind femora are only moderately thickened, without prominent basal spines, and with about five short, ventral spines distributed along the middle, exclusive of the apical, lateral, overlapping spinuous plate. The whole of the femora and the apically-produced tibiæ are shining black. The base of the latter very narrowly rounded. The hind tarsi are blackish. *Wings* : greyish and almost smoky ; strongly villose except along the basal cell ; the spurious vein is heavily chitinized, the stigmal cell is light brownish on the basal third and without stigmal cross-vein.

*Holotype* : a female, from Christmas Island, Indian Ocean, April 1, 1933, Dr. Harms, 1934-32. *Paratypes* : two females, same data.

IV.—*The Names of the Elephants of Ceylon.* By  
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IN a recent article Pocock (1943), while admitting that the Ceylon elephant was separable into two races as subdivided by Deraniyagala (1939), (1941) has attempted to show that the rarer one is the "forma typica." In 1754 Linné named the Ceylon elephant *Elephas indicus* ; but in his tenth edition of 'Systema Naturæ' (1758) he renamed it *Elephas maximus*. The animal is described thus : "Habitat in Zeylonæ Paludis ad amnes. Dentes

*Laniarii superiores exserti* (Ebur.). *Laniarii superiores elongati*," which means that *Elephas maximus* frequents swamps near the rivers of Ceylon and possesses protruding upper incisor teeth (of ivory) that are elongate. Pocock states that Linné's description of the animal's habitat agrees with the one laid down for the large race newly described from the flood plain of the Mahavili river only. The latter author, however, states "rivers" and not "river," and since swamps occur near most Ceylon rivers at various elevations, he cannot be restricted to the swamps of the Mahavili river in particular. Pocock also omits Linné's reference to protruding teeth, a character sufficiently conspicuous for some authorities to maintain that Linné was only familiar with tuskers (Lydekker 1916). *Elephas maximus vilahya*, to which Pocock now attempts to assign Linné's definition, was described originally as "Tusks rare, when present usually on one side only, tushes usually completely hidden under lip," and was described by Pocock himself as "A large tuskless race" (1943). He further assumes that the specific name *indicus* was altered to *maximus* after Linné was informed of the huge size of the Mahavili elephants by travellers who called at Trincomalee, where this river enters the sea. Linné's first choice of *indicus* was probably due to the fact that Ceylon was regarded as a part of the Indies. His subsequent alteration to *maximus* was doubtless based upon the view then generally held that the Ceylon elephants were superior to those of all other countries.

The description taken down by Pliny from the Sinhala ambassadors at the Court of the Roman Emperor Claudius in 44 A.C. is "*Elephantes ibi multos majores et bellicosiores quam quos fert India*," meaning that the Ceylon elephants were more numerous, larger and more warlike than those of India. Ptolemy, the Egyptian, inserts the following sentence near his map of "Taprobane" (151 A.C.) "*mittit proceriores qua alibi inueniantur elephantes, melioresque*." Aelian (1666) also emphasizes their superiority, and Ribeiro the Portuguese (1658) states on page 7 that they are the best in the East (p. 9), that traders come to Colombo, Ceylon's foremost port, from Bengal, Persia and the Red Sea to purchase them, and

(p. 61) that "they pay more for one animal from this country than for two or four from any other part."

The evidence of the maps also fails to support Pocock's contention regarding Trincomalee, *e. g.*, Ptolemy's Taprobane (151 A.C.) has the legend "Pascua Elephantorum" inserted across its south, which is named "Rhogandani"; a corruption of Ruhuna, the archaic name for the Sabaragamuva and Southern Provinces, which supplied the Sinhala Kings and the Portuguese, Dutch and English with the bulk of their elephants. The feeding grounds of elephants were similarly marked in other early maps of Ceylon, and the Colombo Museum possesses one dated 1486 A.C. The map by Petrus Plancius (1650) shows such an area to the north-west of Ceylon, that by de l'Isle (1722) has the South with the inscription "pays ou l'on chafse les Elephants," while a map of Colombo, dated 1730, shows that an elephant kraal was held on the present Ridgeway golf links of the city.

As elephants were generally exported from Colombo, Karaduva, Manaar and Kayts, it is evident that the Ceylon elephants that were best known in 1754 were not from Trincomalee or the Mahavili river. Linné's name was applied to the entire elephant population of Ceylon until de Blainville (1845) restricted the former name of *Elephas indicus* to Ceylon animals with tusks, and regarded the Island's tuskers as a new race which he named *Elephas indicus ceylanicus*. de Blainville's view was partially accepted by Lydekker of the British Museum, who, however, considered that Ceylon only possessed a single indigenous race that was tuskless, and that the tuskers belonged to a race introduced by man from South India. The recent discovery of fossil tuskers of *Elephas maximus sinhalensis* from Pleistocene deposits in Ceylon renders this view untenable (Deraniyagala 1939 a, and Chasen 1940). The degree of tusk development is only one of the several characters essential for distinguishing apart races of *Elephas maximus*, and each race possesses "tuskers," some in greater abundance than others (Deraniyagala 1939). If the identity of the forma typica was so doubtful as to necessitate arbitrary definition the question was settled when de Blainville gave Linné's name of *Elephas indicus* as the common tusk elephant of

Ceylon. Since the tuskers of any race of *Elephas maximus* cannot be regarded as racially distinct, Blainville's name for them, namely *Elephas indicus ceylanicus* becomes a synonym for *Elephas indicus indicus* Linné, which is now replaced by *Elephas maximus maximus* Linné.

The Province of Sabaragamuwa was recently designated its type locality (Deraniyagala 1939). Consequently, it is not possible for Pocock either to arbitrarily designate the new race of elephant restricted to the Mahavili river as the "forma typica," nor is there anything to support his contention "that it was to this 'swamp elephant' that Linnaeus applied the name *maximus*." The two races of elephant inhabiting Ceylon are the common "forma typica" *Elephas maximus maximus* generally with protruding upper incisors, and the large *Elephas maximus vilabiyu* which has them usually completely covered by the upper lip

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V.—*A new Phasmid from Iraq (Orthoptera)*. By  
 B. P. UVAROV, D.Sc., Imperial Institute of Entomology.

#### *Gratidia kurda*, sp. n.

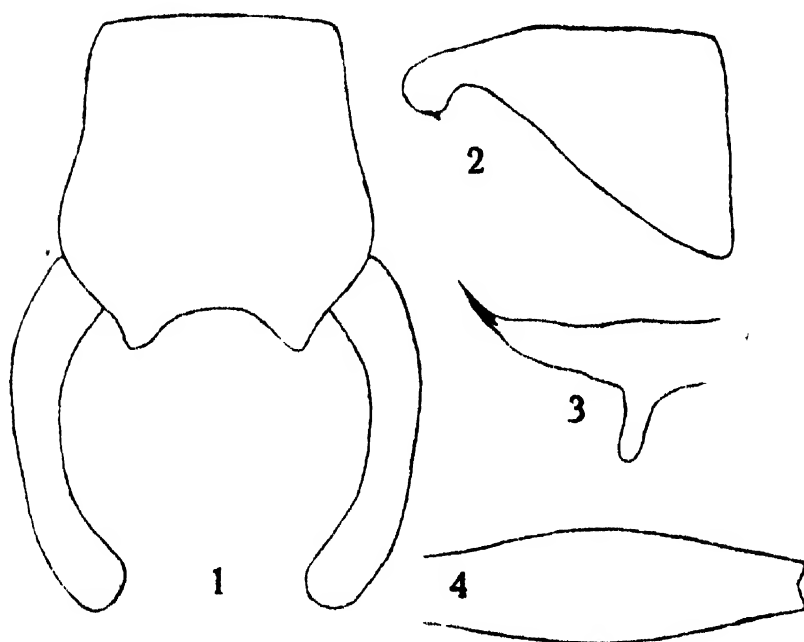
♂ (*type*).—Head distinctly longer than pronotum, without tubercles; no median carina and only weak postocular carinæ. Antenna of 23 segments, longer than half the anterior femur; 1st somewhat expanded and flattened, four times the length of 2nd, which is weakly transverse; 3rd as long as the 1st; 4th–16th strongly elongated; 17th–22nd less so, gradually getting shorter towards the apex; 23rd more than twice the length of 22nd, pointed.



Pronotum about 2.5 times as long as broad, with a weak median longitudinal furrow, and obtuse, somewhat sinuate lateral carinulae. Mesonotum and metanotum with a fine median carinula. Median segment a little longer than broad, scarcely separated from metanotum.

Abdominal tergites smooth, except 8th and 9th (the anal), which are weakly carinulate along the middle. The anal tergite, seen from above (fig. 1) is emarginate

Figs. 1-4.

*Gratiidia kurda*, sp. n.

- 1, male anal segment and cerci, from above ; 2, male anal segment, side view ; 3, male penis, side view ; 4, female operculum, from below.

behind, with two lateral tubercles ; these tubercles each bear a black spinule underneath (fig. 2), the lower edge of the tergite also bears several irregularly placed small spinules. Subgenital plate convex, parabolic in outline, a little longer than its basal width. Penis (fig. 3) with a finger-like process, perpendicular to the penis, arising from the thick basal portion ; apical two-thirds of the

penis narrower than its base, weakly recurved, ending in a black spine. Cercus (fig. 1) weakly curved, thickened at the base and very slightly clavate.

♀ (*paratype*).—Head considerably longer than pronotum, smooth. Antenna about one-fourth the length of front femur, of 24 segments; 1st expanded, five times the length of 2nd, which is transverse; 3rd (apparently formed by the fusion of 2–3 segments) half the length of the 1st; 4th–7th weakly transverse; 8th–13th elongate, the 13th particularly so, being equal to the 3rd; 14th–23rd moniliform, mostly transverse; 24th three times the length of 23rd, pointed.

Pronotum about twice as long as broad, with a scarcely perceptible median longitudinal depression and obtuse, somewhat sinuate, lateral carinulae. Mesonotum and metanotum with a fine median carinula which extends also on to the abdominal tergites though it is weaker there. Median segment a little broader than long, distinctly separated from the metanotum. Anal tergite broadly rounded behind, with a shallow median emargination. Operculum extending a little beyond the middle of the anal tergite, lanceolate, with the apex emarginate (fig. 4). Cercus short, straight, weakly clavate.

*Measurements*.—Total length, ♂ 49.3, ♀ 69; head, ♂ 2.8, ♀ 4; antenna, ♂ 10.5, ♀ 7; pronotum, ♂ 2, ♀ 3; mesonotum, ♂ 9, ♀ 14; metanotum, ♂ 8, ♀ 11; median segment, ♂ 1.5, ♀ 2; abdomen, ♂ 26, ♀ 35; operculum, ♀ 5; front femur, ♂ 18, ♀ 24; middle femur, ♂ 12, ♀ 17; hind femur, ♂ 15, ♀ 21 mm.

IRAQ: Lower end of the Zakho Gorge, N. of Mosul, amongst grasses, far from any trees or shrubs. 7. x. 1942 (*F. Bodenheimer*). Type (♂) and paratype (♀), taken in copula; deposited in the British Museum (Natural History).

The assignment of this new species to the genus *Gratidia* is a tentative one, since the group of, apparently, closely allied genera *Gratidia* Stål, 1875, *Leptynia* Pantel, 1890, *Ramulus* Saussure, 1870, *Phthoa* Karsch, 1898, *Leptyniella* I. Bolivar, 1926, and *Adelungella* Brunner, 1907, requires a thorough revision before the number of independent genera, their characters and synonymy can be established.

The species described above is considered new because the known Palearctic species of *Gratidia* differ from it, as follows :—

*G. adelungi* Brunner, 1907 (Transcaspia). ♂: head with two spinules; anal segment truncate.

*G. inconspicua* Brunner, 1907 (Bukhara and Persia). ♂: anal segment triangularly excised. ♀: operculum short, acuminate.

*G. bituberculata* Redtenbacher, 1889 (Transcaspia). ♂: anal segment obtuse. ♀: operculum acuminate. ♂♀: head with two carinulae. (*G. aliena* Brunner, 1907, is a synonym of this species; see Mistshenko, Proc. R. Ent. Soc. London, B, vol. vi. 1937, p. 119.)

*G. spinulosa* Brunner, 1907 (S. E. Persia). ♀: acute tubercles on mesonotum and metanotum; operculum lanceolate.

*G. uvaroviana* Mistshenko, 1937 (Transcaspia). ♀: tubercles on mesonotum, metanotum and tergites; operculum with triangular apex.

Since it is most unlikely that an apterous Phasmid species would be of a very wide distribution, I do not feel it necessary to compare *G. kurda* with the very numerous members of the genus described from Africa, the majority of which, moreover, belong to the group with a strongly-specialized male anal segment.

The new species can be distinguished from the known members of the Western Mediterranean genera, *Leptynia* and *Leptyniella*, by considerably longer antennae of both sexes, by non-dentate male cerci and by the relatively longer female operculum. From the genus *Adelungella*, with one species in S.E. Persia, *G. kurda* differs by the unarmed thorax. The genera *Ramulus* and *Phthoa* do not contain Palearctic species, unless *Ramulus* is recognized as an earlier name for *Gratidia* (see Karny, Treubia, vol. iii. 1923, p. 236), in which case the Palearctic species of *Gratidia* listed above would merely change their generic name.

VI.—*Description of a new Genus of Euæsthetinæ (Col., Staph.).* By MALCOLM CAMERON, M B , R N , F.R.E.S.

MESOÆSTHETUS, gen. nov

INTERMEDIATE between *Geosthetus* Oke and *Austroæsthetus* Oke differs from the first in the immarginate abdomen (except for the 7th tergite) and structure of the maxillary palpi, from the latter in the narrow acute non-carinate mesosternal process and the very small eyes, from both in the large impunctate depression on the temporal region limited all round by a fine raised keel. With *Austroæsthetus* it forms a tribe, the Austroæsthetini.

In general facies somewhat resembling *Stenæsthetus* Shp., but differing in the tarsal structure, shape of head and structure of parts of the mouth. Elongate, cylindrical, the head subquadrate, the neck stout, eyes small, of 7 or 8 facets only, the temple with an oval impression limited by a fine sharp edge; gular sutures fused. Antennæ 11-segmented, the last two segments forming a club. Labrum very short and broad, the anterior border gently rounded and closely and finely serrate. Mandibles long and slender, curved, each with a short sharp tooth about the middle. Maxillary palpi much as in *Stenæsthetus* but shorter, the 1st segment elongate, a little thickened towards the apex, 2nd a little longer but otherwise similar, 3rd oval, a little longer and much thicker than the 2nd, 4th minute, acicular. Outer lobe of maxilla short and broad, subquadrate, corneous, membranous at apex and furnished with fine, slightly curved hairs, the inner lobe very similar. Mentum transverse, trapezoidal, the sides feebly rounded, truncate at apical margin, the anterior angles very slightly prominent. Tongue broad, corneous, the sides rounded, the apical border with deep crescentic emargination, the horns of the crescent each with a small membranous nipple-shaped appendage. Paraglossa rather feeble, not extending beyond the level of the tongue. Labial palpi 3-segmented, the 1st small and short, the 2nd large, stout, oval, 3rd acicular about half as long as the 2nd. Prosternum and prosternal epipleura well developed, the former without median keel. Mesosternum not carinate,

its process narrow and pointed, meeting the acute metasternal process, the middle coxæ narrowly separated. Abdomen cylindrical, immarginate, except the 7th tergite, the 1st sternite with well-marked median keel. Legs moderate; tibiæ simple. Tarsi all 4-segmented, the anterior with the 1st segment short, narrowed at the base, as long as the two following together, these equal, scarcely as long as broad, the 4th almost as long as the three preceding together; middle scarcely differing from the anterior; posterior with the 1st segment slender, elongate, as long as the 2nd and 3rd together, these subequal, slightly longer than broad, stouter than the 1st, 4th as long as the 2nd and 3rd together. Claws simple, slightly curved.

*Key to the Tribes of Euæsthetinæ.*

- |   |                   |
|---|-------------------|
| 1. All the tarsi 4-segmented.....                                 | 2.                |
| — Tarsi otherwise .....   | 3.                |
| 2. Abdomen margined. Antennæ of 9 or 11 segments .....            | EUÆSTHETINI.      |
| — Abdomen not margined. Antennæ 11-segmented.....                 | AUSTROÆSTHETINI.  |
| 3. Tarsi 5, 5, 5. Abdomen bordered. Antennæ 11-segmented .....    | NORDENSKIOLDIINI. |
| — Tarsi 5, 5, 4. Abdomen not bordered. Antennæ 11-segmented ..... | STENÆSTHETINI.    |

*Mesoæsthetus wilsoni*, sp. n.

Moderately shining, ferruginous red. Antennæ and legs reddish yellow. Length 2 mm.

In colour much like *Stenæsthetus sunioides* Shp., but more shining. Head transverse, subquadrate, as broad as the thorax; eyes small, much shorter than the temples, which are impressed, the impression bounded by a fine raised line; behind the feebly elevated antennal tubercles with a pair of small foveæ; sculpture coarse, coriaceous, without punctures. Antennæ short, scarcely extending to the middle of the thorax, the 1st and 2nd segments of equal length and stouter than the following, 3rd half as long as the 2nd, 4th slightly longer than the 3rd, 5th slightly longer than the 4th, 6th shorter than 5th, 7th and 8th moniliform, 9th slightly transverse, 10th much stouter, 11th stout, conical. Thorax as long as broad, the sides gently rounded, a little more retracted

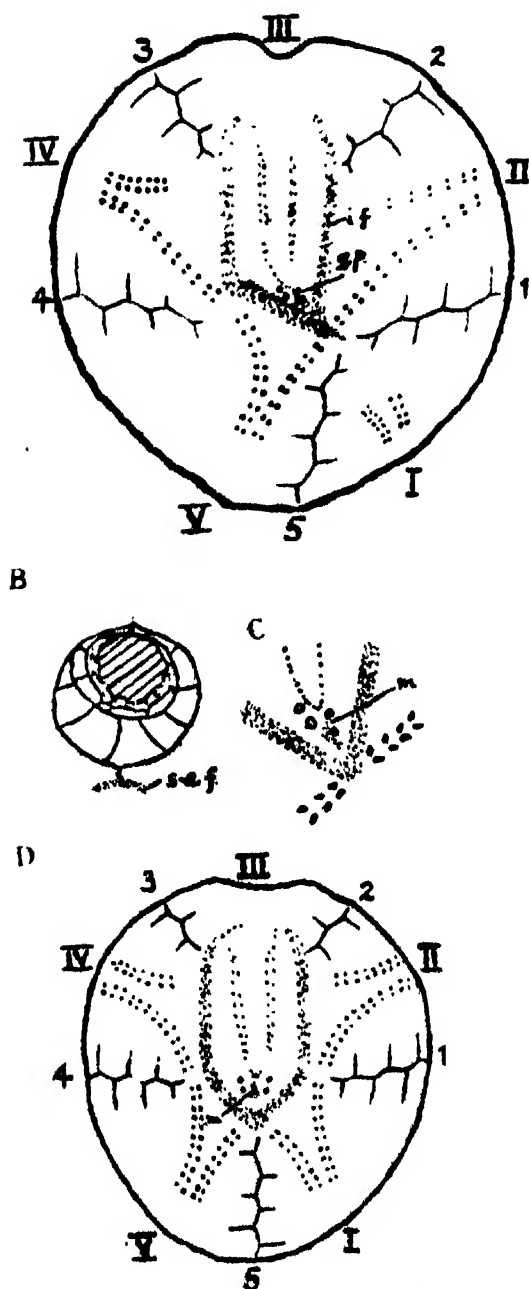
behind, the posterior angles with small, distinct impression, on each side before the base with a larger, broader but superficial one; sculpture as on the head. Elytra as broad but scarcely half as long as the thorax, with finer coriaceous sculpture. Abdomen very finely, moderately closely punctured throughout, with a very fine reticulate ground-sculpture, the pubescence yellow, rather long and close. Fore-parts with shorter and less close pubescence.

♂.—3rd sternite with superficial impression at the middle of the posterior border; 4th with a deep narrow impression in the middle of the posterior two-thirds, its margins closely ciliate; 5th with a similar impression in the whole length; 6th with deep arcuate emargination of the posterior border. Warburton (*F. E. Wilson*). 20. xi. 1927. Type in my collection.

VII.—*A Note on an Abnormal Specimen of Echinocardium cordatum* (Pennant). By Professor H. P. LEWIS.

OVER seven hundred specimens of the tests of *Echinocardium cordatum* were collected, for statistical purposes, in October, 1942, on the beach at Borth, Cardiganshire, after a storm. The majority of these tests were unbroken but had lost their covering of spines, so that the surface features were clearly displayed. These unbroken tests were accompanied by an even greater number of broken ones, so that approximately two thousand specimens, in all, were cast up by the waves at one time on a stretch of beach about one hundred yards long. Only one specimen of all those examined shows sufficient abnormality of growth to cause marked effect on the symmetry of the urchin. In this case the departure from the normal appears to have resulted from fracture, and subsequent healing, of the test, at an early stage, just posterior to the genital plates. The occurrence of this abnormal form and of the adjustments made by the urchin in the arrangement of its plates to offset the injury, seem to be worthy of record.

Figs. A-D.



*Echinocardium cordatum* (Pennant). Sketches to show: A, abnormal test; B, periproct and C, apical region of "A"; D, normal test for comparison with "A." Genital pores, *g.p.*; madreporite, *m*; internal fasciole, *i.f.*; subanal fasciole, *s-a.f.* A  $\times 1.8$ ; B & C, enlarged; D, natural size.

## 72 *An Abnormal Specimen of Echinocardium cordatum.*

The line of fracture is indicated by a depression of the test which runs nearly parallel to the posterior portion of the internal fasciole (see fig. A). The general effect of the damage has been to bring the Interambulacral Areas I and 5 together in the vicinity of the apical system, so that this has become isolated from the Ambulacral Area I. Within this area compression of the plates has occurred, for in the posterior column of Amb. I. there are seven pore-pairs within 5 mm., while in the corresponding column of Amb. V. eight pore-pairs occur in 8.5 mm., which is the normal spacing. In the anterior column of Amb. I. there are only four pore-pairs, five less than in the corresponding column of Amb. V., but these are more widely spaced.

The posterior column of Amb. V. is deflected across the position of the plane of bilateral symmetry in a normal test and runs directly towards the posterior column of Amb. II., so that the pore-pairs of each are almost continuous, being separated only by the angle of the internal fasciole (see fig. C.) The Interamb. 5, as shown in fig. A. is deflected for a considerable distance away from the plane of symmetry near the apical system, but it gradually resumes its normal position in the periproctal region. The periproctal plates themselves, however, show some disturbance of the symmetry (see fig. B), and this is not fully restored until the plates enclosed by the subanal fasciole are reached.

The apical end of Amb. III. is deflected towards Amb. II. and, within the apical system, the genital pores and the madreporite are elongated in the same direction, that of the fracture. The posterior portion of the internal fasciole is also influenced by the fracture, as shown in figs. A and C.

The specimen supplies one more instance of the facility with which the echinoderms in general are capable, when injured, not only of the regeneration and restoration of lost parts, but also of the modification of the form and relative attitudes of existing essential structural elements to meet new demands.



# THE ANNALS AND MAGAZINE OF NATURAL HISTORY

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VIII.—*On the Genera of the Tribe Cyphicerini (Col., Curc.).*—I. By Sir GUY A. K. MARSHALL, K.C.M.G., F.R.S.

THE weevils of the tribe Cyphicerini belong to the subfamily Eremninae, which was first established by Lacordaire, although what we now call subfamilies he called tribes. This subfamily is essentially an Old World group, but in the 'Catalogus Coleopterorum' (pt. 114) three New World genera are included in it. Of these, one wingless genus, *Phyxelis* Schönh., occurs in North America, but as it has multisetose mandibles, whereas all the Eremninae have only three setae on these organs, it is proposed to transfer it to Lacordaire's Leptopinae. The other two genera are South American, and each contains only a single species: *Priocnemis* Kirsch (Peru) and *Bolivianus* Hust. (Bolivia). These are unknown to me, but the latter is described as having squamose mandibles, a character which would exclude it from the Eremninae; the retention of *Priocnemis* in the subfamily thus becomes highly dubious, and it seems desirable to refer both genera provisionally to the Leptopinae, which are well represented in South America.

It may be noted that Lacordaire distinguished the latter subfamily from the Eremninae solely on the form and direction of the antennal scrobes on the rostrum; but these two types merge gradually into one another in

various cases, so that it appears more satisfactory to use the mandibular chaetotaxy instead for the separation of these two subfamilies, though the form of the scrobe may prove useful for dividing lower categories within the Leptopinæ, when this subfamily is subjected to the critical re-examination which it obviously requires.

But the Eremninæ are not generally distributed throughout the Old World, for no species occurs in Europe west of the Caucasus, or in the Papuan region, or in the Pacific islands. Further, an examination of the seven genera from New Zealand included in the subfamily in the 'Catalogus' (*Caloptes*, *Inocatoptes*, *Neoevas*, *Thotmus*, *Brachyolus*, *Inophlæus* and *Thesius*) shows that they all differ from the Eremninæ not only in having four or more setæ on the mandibles, but also in the form of the epistome of the rostrum. In the Eremninæ this area is more or less concave and glabrous and delimited behind by an angulated or curved (rarely transverse) obtuse ridge or sharp carina; whereas in the New Zealand forms the epistome consists of a raised punctate triangle delimited by a shallow oblique impression on each side, or alternatively it may be entirely undefined. All the New Zealand genera must therefore be transferred to the Leptopinæ; and the same applies to the large Australian genus *Mandalotus* Er., which shares with the South African *Leptostethus* Waterh. the peculiarity of having the front coxæ widely separated. Finally, there are two genera from Indo-China, *Sepionus* Aur. and *Cylindromus* Aur., which have densely setose mandibles and must also be removed to the Leptopinæ.

As thus restricted, the Eremninæ are therefore confined to Asia and Africa, with a few outliers in Australia, which appear to represent an intrusion from the Malay Archipelago.

In dealing with the Eremninæ, Lacordaire divided them into three groups: the Cyphicerides, in which the rostrum at its base is as wide as the head, and the others in which it is narrower, these being again subdivided into the Eremnides, in which the rostrum is not or but slightly dilated at the apex, and the Phytoscaphides, in which it is strongly dilated. The extreme forms in these categories certainly present marked differences in facies, but with the much larger number of species now available these

characters show so much intergrading that they can no longer be used for major divisions.

Kirsch long ago pointed out the unsatisfactory nature of the distinction between the Eremnides and Phytoscaphides (Berl. ent. Zeits. xviii. 1874, p. 392), and suggested that they should be separated on the form of the elytra, namely, whether or not true shoulders were present. The loss of the shoulders and the accompanying reduction in the side-pieces of the mesosternum, and eventually of the metasternum, are directly correlated with the loss of the power of flight, a condition which occurs widely among the adelognathous Curculionidæ. But the use of this character presents certain difficulties, because it is certain that in many cases reduction of the wings is a comparatively recent phenomenon, and is indeed taking place at the present time. For not only are there genera that contain winged and wingless species (these terms, though not precisely accurate, may be used for the sake of brevity), but there are genera (*Tanymecus*, *Sitona*, etc.) in which the transition is taking place within a single species, so that some individuals can fly, whereas in others the wings are no longer functional.

On the other hand, it is clear that there are large groups of these weevils in which the loss of the wings must have been established for a very long time and should therefore supply us with a reliable taxonomic character. The question thus arises as to whether there is any other structure correlated with winglessness which is not too closely connected with the reduction of the wing muscles and which may thus give an indication of the early origin of this condition. I believe that such a character is to be found in the form of the intercoxal process of the first visible ventrite of the abdomen.

In the Eremninae, at least, the winged species have this intercoxal process comparatively narrow, with its anterior margin angulate, ogival or curved; and this is also the case in the wingless genera that appear to be most closely related to them. In the more specialized wingless genera, however, this process is broadly truncate, and seems to afford a reliable character for making a primary division of the subfamily, separating off the true Eremnini from the rest. This division is borne out in an interesting way by the geographical distribution of the

tribe, which is confined to Africa south of the Zambesi and Madagascar, for within that area there are no other Eremninae whatever.

It is therefore proposed to divide the Eremninae into the following three tribes :—

- |  |                         |
|--|-------------------------|
| 1 (2). Intercoxal process of venter broadly truncate ; insects incapable of flight ; mentum without setæ on the disk . . . . . | EREMNINI.               |
| 2 (1). Intercoxal process of venter narrower, angulate, ogival or rounded ; mentum with 2-8 setæ on the disk.                  |                         |
| 3 (4). Elytra without shoulders, wings not functional . . . . .  | [TRACHELINI<br>ACANTHO- |
| 4 (3). Elytra with shoulders, wings functional (except in <i>Meionops</i> Mshl.) . . . . .                                     | CYPHICERINI.            |

*Meionops* is the only genus known at present that is intermediate between the last two tribes, but it has retained the form of its winged relatives, although the elytra are rather narrower across the shoulders, which are present though somewhat reduced.

With regard to the Acanthotrachelini, it need only be noted here that the tribe is restricted to Asia, with the exception of two or three species recorded from Australia.

The Cyphicerini have a precisely similar distribution, except that four genera occur also in the northern half of Tropical Africa. Two of these, *Myloцерopsis* Aur. and *Afrophytoscaphus* Hust., are peculiar to that area ; whereas *Amblyrrhinus* Schönh. ranges from India, through Arabia to Senegal and northern Nigeria. There remain a few species erroneously attributed to *Corigetus* Desbr., the generic allocation of which has not yet been settled, though they appear to have Oriental affinities.

There is at present no classification of the Cyphicerini, and an attempt is therefore now made to initiate one, as the number of species available has greatly increased of recent years. This has necessitated the erection of a good many new genera, which are based largely on new characters drawn from the rostrum. The arrangement suggested is purely tentative, because our knowledge of the species occurring in Tropical Asia is so limited that their numbers might easily be increased five or even ten times, in which case many of the distinctions here used may well break down.

The primary character suggested for dividing the tribe is the chaetotaxy of the mentum, forming two groups, in one of which the mentum bears only two setæ on the

disk, whereas in the other there are four or more setæ—four being much the most usual number. Only the second group will be dealt with here, and the following is a list of the existing genera that fall into the bisetose group :—*Cyphicerus*, *Mylocerinus*, *Amblyrrhinus*, *Pollendera*, *Peltotrachelus*, *Phytoscaphus*, *Chloëbius*, *Epilasius* and *Deiradolcus* (1941) ; but this will have to be considerably extended later.

Of the 28 genera of Cyphicerini that have been described up to now, 9 are known to have two setæ on the mentum and 14 to have four or more. Unfortunately, there remain 5 genera unknown to me which cannot be placed in these groups ; they were all based on single species and are as follows :—*Cyriophthalmus* Fst. (Amur), *Howeocis* Lea (Lord Howe I.), *Ophthalmus* Mshl. (*Oops* Germ. preocc.) (Australia), *Oxyophthalmus* Hochh. (Caucasus) and *Peronaspis* Suvorov (Bokhara). As a result of this revision 12 new genera have had to be added, so that 26 genera are dealt with in the key given below.

Owing to the use of new characters which are not mentioned in the descriptions of previous authors, it is often impossible to place in their proper genera older species that are unknown to me, and which are not at present accessible ; but this applies to less than a quarter of the described species, and a good many of these are probably already in their right genera.

In the following key importance is attached to the form of the dorso-lateral carinæ on the rostrum, and it may be explained that these carinæ are only those which arise from the inner margin of the scrobes and are continued backwards towards the base. The space between these carinæ is called the dorsal area, and the spaces adjoining them externally, the lateral areas.

*Key to the Genera of Cyphicerini having 4-8 setæ  
on the mentum.*

- 1 (6). Rostrum with the dorso-lateral carinæ extending on to the head.
- 2 (8). The whole dorsal area of rostrum ascending the frons in the form of a flat plate, broadly truncate at its base and separated from the frons by a narrow incision ; front margin of pronotum projecting over the head (India) ..... *Aspidomycter* Mshl.

- 3 (2). Dorsal-lateral carinae of rostrum ascending the frons but not separated from it by any incision; front margin of pronotum truncate.
- 4 (5). Eyes large, quite flat; rostrum at base as broad as head; prothorax rounded laterally, widest about middle, shallowly bisinuate at base; distal joints of funicle as long as broad, club short, ovate; mentum with 4 setae (India) ..... *Baryrrhinus*, g.n.
- 5 (4). Eyes small, strongly convex; rostrum narrower than head; prothorax subconical, widest at the deeply bisinuate base; distal joints of funicle much longer than broad, club very long, narrow; mentum with 6-8 setae (Burma to Java) .. *Deiradurhinus* Muhl.
- 6 (1). Dorsal-lateral carinae of rostrum not ascending the frons.
- 7 (8). Dorsal area of rostrum much wider than the frons, the dorsal-lateral carinae running quite straight and parallel from the apex to the front margin of the eyes, the median carina continued apically across the middle of the epistome (Burma) *Ortholcus*, g.n.
- 8 (7). Dorsal area of rostrum not wider than the frons, the dorsal-lateral carinae at most in a line with the inner margins of the eyes, the median carina not crossing the epistome.
- 9 (10). Rostrum with its lateral areas vertical, so that the scrobes are entirely lateral, the dorsal area as broad as the frons and quite flat (Indo-China) ..... *Platytrachelus* Schh.
- 10 (9). Rostrum with its lateral areas sloping outwards, the scrobes fully visible from above, the dorsal area narrower at base than the frons (except in *Epixynus* and *Asynetus*).
- 11 (12). Scrobes steeply and completely enclosed behind, their outer margin as high as the inner one; prothorax subconical, widest at the very deeply bisinuate base; mentum with six setae (Transcaucasia to Burma) ..... *Platymycterus* Muhl.
- 12 (11). Scrobes more or less ill-defined posteriorly, never completely enclosed transversely, the outer margin always lower than the inner one.
- 13 (40). Epistome short, its posterior margin broadly rounded or forming a wide obtuse angle, which does not extend behind the point of insertion of the antennae.

- 14 (15). Front tibiae with the external apical angle produced outwards; gonae produced forwards into a sharp process (longer in ♀); mentum with six setae; femora without a tooth; 3rd tarsal joint but little wider than 2nd (Transcaspia) . . . . *Taurostomus*, g. n.
- 15 (14). Front tibiae not produced outwards at apex; gonae normal; mentum with four setae; femora with a tooth; 3rd tarsal joint much wider than 2nd.
- 16 (21). Lateral areas of rostrum with an oblique curved costa from the upper edge of the scrobe towards the middle of the eye.
- 17 (18). Scrobes straight and narrow; dorsal area of rostrum at base raised high above the frons (Palaeartic) . . . . *Corigetus* Desbr.
- 18 (17). Scrobes broad, strongly curved inwards behind; dorsal area of rostrum on a level with the frons.
- 19 (20). Prothorax subconical, with the sides straight, much wider at base than at apex, basal angles acute; basal margin of elytra not raised (Palaeartic) . . . . . *Hercomycterus*, g. n.
- 20 (19). Prothorax with the sides rounded, incurved at base, which is only slightly wider than apex; basal margin of elytra obtusely raised (Palaeartic) . . . . . *Hypsedaphus*, g. n.
- 21 (16). Lateral areas of rostrum without such a costa.
- 22 (25). Middle femora flattened and widened at base, and also the other pairs to a less extent.
- 23 (24). Rostrum with the dorso-lateral carinae quite straight and parallel from base to apex; scrobes parallel, the greatest distance between them narrower than the frons (India) . . . *Paramyctes*, g. n.
- 24 (23). Rostrum with the dorso-lateral carinae curving strongly outwards at apex; scrobes curving inwards behind, the greatest distance between them as broad as or broader than the frons (India) . . . . . *Thlipsomerus*, g. n.
- 25 (22). Femora normal, pedunculate.
- 26 (27). Dorsal outline of rostrum strongly curved, the dorso-lateral carinae sharp and overhanging the lateral areas; body devoid of scaling (India) . . . . . *Epixynus*, g. n.
- 27 (26). Dorsal outline of rostrum flat, the dorso-lateral carinae not overhanging the lateral areas; body squamose.

- 28 (37). Postocular lobes of prothorax well developed.
- 29 (36). Greatest distance between the scrobes not or but slightly wider than the frons.
- 30 (35). Rostrum not longer than broad; lateral margins of elytra near base excised to receive the dilated base of metepisterna; funicle with joint 2 not shorter than 1
- 31 (32). Prothorax subconical, much wider at base than at apex, sides straight; intercoxal process of mesosternum unusually broad, broader than apex of scape; prosternum with a high longitudinal laminate process behind coxae (Java) ..... *Cnolostethus*, g. n.
- 32 (31). Prothorax rounded laterally; intercoxal process of mesosternum narrower than apex of scape; prosternum without any erect laminate process.
- 33 (34). Dorsal area of rostrum at base narrower than frons (India, Burma, Philippines) ..... *Cyphicerinus* Muhl.
- 34 (33). Dorsal area of rostrum at base as wide as frons (Burma, Siam, Borneo) ..... *Asynetus*, g. n.
- 35 (30). Rostrum distinctly longer than broad; lateral margins of elytra not excised near base; funicle with joint 2 shorter than 1 (Africa).... [Hust. *Afrophytoscaphus*
- 36 (29). Greatest distance between the scrobes twice as wide as the very narrow frons or more, base of prothorax deeply bisinuate (India) ..... *Piezophrys*, g. n.
- 37 (28). Postocular lobes of prothorax feeble or obsolete and replaced by vibrissae; base of prothorax truncate or very shallowly bisinuate.
- 38 (39). Frons tumid, as wide as the greatest distance between scrobes; a broad bare space behind the epistome; antennal scape with stiff erect setae (China, Burma) ..... *Oedophrys* Muhl.
- 39 (38). Frons not tumid, narrower than the greatest distance between scrobes; no bare space behind the epistome; scape without erect setae (India, Burma) ..... *Cyrtapistomus* Muhl.
- 40 (13). Epistome more or less elongate, its carinate hind margin forming a narrow angle (never broader than a right angle) which extends behind the point of insertion of the antennae.
- 41 (44). Scrobes partly enclosed behind by a bare carina running obliquely in a curve from the inner edge of the scrobe towards the middle of the eye.



- 42 (43). Prothorax subconical, widest at base, much narrower at apex; rostrum not or but little dilated at apex; basal joints of antennal club with the margins oblique or sinuate (India, China to Philippines and Borneo) ..... *Phrixopogon* Mshl.
- 43 (42). Prothorax rounded laterally, widest about middle, base not wider than apex; rostrum very strongly dilated at apex; joints of club truncate (Africa) ..... *Myloцерopsis* Aur.
- 44 (41). Scrobes without such a carina.
- 45 (48). Rostrum dorsally continuous with the frons; femora with a small spine-like tooth.
- 46 (47). Prothorax truncate or subtruncate at base, postocular lobes feeble or obsolete; antennae setose, funicle with joint 7 longer than basal joint of club; lateral areas of rostrum sloping gradually outwards (India) ..... *Doliophron* Mshl.
- 47 (46). Prothorax deeply bisinuate at base, postocular lobes well developed; antennae squamose, funicle with joint 7 shorter than basal joint of club; lateral areas of rostrum steeply declivous (India) ..... *Hilans*, g. n.
- 48 (45). Rostrum separated from the frons by a shallow transverse impression; femora with a rather large triangular tooth, carinate on its distal edge (except in *Crinorrhinus strabo* Mshl.).
- 49 (50). Width of frons twice the length of an eye; funicle with joint 1 longer than 2; mandibles with a sharp median tooth; wings not functional (India) ..... *Meionops* Mshl.
- 50 (49). Width of frons not or but slightly greater than the length of an eye; funicle with joint 1 not longer than 2; mandibles without a median tooth; wings functional (India, Burma) ..... *Crinorrhinus* Mshl.

#### ASPIDOMYCTER Mshl.

*Aspidomycter* Marshall, Ann. & Mag. N. H. (11) x. 1943, p. 108.

This genus contains two species from India.

#### BARYRRHINUS, gen. nov.

*Head* with the dorso-lateral carinae of the rostrum ascending the frons but not separated from it by any

transverse incision; eyes flat. *Rostrum* stout, as long as broad, only slightly dilated at apex, its sides forming a continuous line with those of the head; the margins of the dorsal area forming two high obtuse ridges which ascend the frons and curve outwards anteriorly; epistome elongate, its margin sharply carinate and forming an acute angle which extends behind the antennæ; scrobes short, entirely visible from above, somewhat enclosed in front; mentum with four setæ. *Antennæ* stout, squamose throughout; scape curved, cylindrical, not widening towards apex; funicle narrowing distally, the first two joints equal; club short, ovate, the margins of the joints sinuate. *Prothorax* transverse, rounded laterally, shallowly bisinuate at base, the apical margin truncate dorsally, postocular lobes and vibrissæ present. *Elytra* with the obtusely rounded shoulders not very prominent, the apices dehiscent, the intervals with a single row of fine erect setæ. *Legs* stout; femora with a small sharp tooth; corbels of hind tibiæ with two rows of setæ externally, the outer setæ very short and inconspicuous, the inner ones of normal length, and within these an obtuse bare carina; claws free.

Genotype: *Buryrrhinus planoculis*, sp. n.

This monotypic genus is readily distinguished by the broad rostral carinæ ascending the head, the unusually thick undilated antennal scape, the tapering funicle, and the short ovate club. The only other genus in the Cyphicerini that presents the first of these characters is *Deiradorrhinus* Mshl. (Ann. & Mag. N. H. (11) viii. 1941, p. 369), which, however, differs as follows: mentum with 6-8 setæ; antennæ with a more slender and gradually dilated scape, funicle of uniform thickness, and a very long narrow club; prothorax subconical and deeply bisinuate at the base.

*Buryrrhinus planoculis*, sp. n.

♀. Derm black, with dense scaling throughout; rostrum, head, pronotum and sides of elytra brown; disk of elytra blackish brown, variegated laterally and behind with irregular pale spots; underside grey.

*Head* with the frons transversely convex, its width twice as great as the length of an eye, the median fovea small and deep; eyes quite flat. *Rostrum* stout, its

sides continuous with those of the head, gradually narrowed from base to antennæ, then slightly widened at the genæ; dorsal area raised on each side into a high obtuse ridge, these diverging somewhat behind and ascending the frons, the intervening sulcus without any median carina. *Antennæ* with the thick cylindrical scape clothed with dense overlapping brownish scales and numerous subrecumbent stout setæ; the tapering funicle with dense grey scaling, joint 3 slightly longer than 4, 4-7 about as long as broad. *Prothorax* transverse, gently rounded laterally, widest at about middle, the shallowly sinuate base scarcely wider than the truncate apex; dorsum gently convex longitudinally, highest at about middle, with close deep punctures which are conspicuous through the dense scaling, and a short erect seta in each puncture. *Scutellum* nearly round, slightly raised, densely squamose. *Elytra* somewhat broader at the shoulders than the base of the prothorax, almost parallel-sided (♀), with a very shallow transverse impression close to the base between striæ 1 and 3; the impressed striæ containing deep separated bare punctures; the intervals of equal height, convex, each with a single row of rather long fine erect setæ, the fluted scales densely overlapping. *Legs* stout, with dense greyish-brown scaling; front tibiæ not sinuate at the base.

*Length* 8.0 mm., *breadth* 3.4 mm.

ASSAM: Naga Hills, 1 ♀ (*Doherty*).

#### DEIRADORRHINUS Mshl.

*Deiradorrhinus*, Marshall, Ann. & Mag. N. H. (11) viii. 1941, p. 369.

Includes *isabellinus* Boh. from Java, and *virescens* Mshl. and *illobatus* Mshl. from Burma, the latter ranging into Tonkin.

#### ORTHOLCUS, gen. nov.

*Head* dorsally continuous with the rostrum, the width of the striolate frons equal to the length of an eye; eyes large, broadly ovate, almost flat. *Rostrum* stout, as long as broad, only slightly dilated at apex, its sides almost continuous with those of the head; dorsal area unusually broad, the dorso-lateral carinæ running perfectly straight and parallel from the apex to the anterior margin of the eyes, so that the dorsal area at its base is much wider

than the frons; epistome with its hind margin indistinctly carinate and forming an obtuse angle, divided down the middle by an extension of the median carina of the rostrum; scrobes lateral, straight, extending more than half-way to the eyes, only partly visible from above owing to the overhanging dorso-lateral carinae; mentum with 4-6 setae. *Antennae* slender, entirely devoid of scaling; scape clavate; funicle with joint 2 longer than 1; club elongate, fusiform, the joints truncate. *Prothorax* rounded laterally, widest behind middle, the apex nearly as wide as the shallowly bisinuate base, the postocular lobes well developed. *Elytra* with roundly rectangular shoulders, widest behind the middle, separately rounded at apex, the intervals with a single row of setae. *Legs* with a small triangular tooth on femora; tibiae deeply sinuate at base, corbels of hind pair open; claws free.

Genotype: *Ortholcus carinirostris*, sp. n.

The single Burmese species referred to this genus presents several characters on the rostrum which have not been observed in any other species of the tribe.

*Ortholcus carinirostris*, sp. n.

♂♀. Derm black, rather shiny, without scales except the following: a bluish white line under each eye, a very short white stripe at the apex of the suture on the elytra and a few inconspicuous spots at the sides and behind composed of 3 or 4 white scales in the striae; underside with numerous narrow plumose grey scales on the coxae and a few on the mesosternum. The sternum bears a certain amount of white powder and probably this will be found to occur all over the body.

*Head* with the frons deeply striolate, its width equal to the length of an eye. *Rostrum* as long as broad, very slightly wider at base than at apex, the sides shallowly sinuate; the dorsal area very broad, extending to one-third of the front margin of the eye, with the lateral carinae overhanging the scrobes, a sharp median carina that shortly ascends the frons, and on each side of it (but nearer to the lateral margin) a carina running from about the middle of the rostrum on to the head closely adjoining the eye, the spaces between the carinae with sparse minute shallow punctures. *Antennae* piceous, with

sparse short recumbent setæ; scape rather slender, cylindrical, gradually clavate; funicle with joint 2 much longer than 1, 3 longer than 4, 4-7 subequal, much longer than broad, 7 shorter than basal joint of club. *Prothorax* transverse (4 : 5), gently rounded laterally, widest behind the middle, the apical margin shallowly sinuate in the middle and slightly narrower than the base; dorsum coarsely and rugosely punctate, some of the intervals raised or subgranulate, with a short obtuse ridge on each side near the basal angles; the short subrecumbent pale setæ slightly clavate. *Scutellum* subquadrate, bare, with a few punctures. *Elytra* widest behind the middle in both sexes, more so in ♀, the shallow striae with large round separated punctures: the intervals as broad as or narrower than the punctures, each with a row of small flattened granules giving rise to a short recumbent pale seta, interval 7 costate throughout, 9 much broader in the middle than the adjoining ones. *Legs* black with sparse pale recumbent setæ; anterior pairs of tibiae with a sharp angulation at one-third from base

Length 5.7 mm., breadth 2.9-3.1 mm.

BURMA · Maymyo, 1 ♂, 1 ♀, v.-vi. 1910 (*H. L. Andrews*).

#### PLATYTRACHELUS Schönh.

This genus at present contains three species from Siam and Indo-China, but four other undescribed species are also known from the same area.

"*Platytrachelus*" *chloris* Pasc., from West Australia, is in no way related to the present genus and will have to be transferred to the Acanthotrachelini when that tribe is revised.

#### PLATYMYCTERUS Mshl.

This genus stands much as shown in the 'Catalogus,' except that *Corigetus trapezicollis* must be transferred into it, and *armiger* Fst. falls as a synonym of it. Further, Voss (*Senckbergiana*, xix. 1937, p. 248) has described another species, *afghanisticus*; he has also described two others, *difficilis* and *conjungens* (p. 247), which from the descriptions and figures clearly do not belong to this genus, but they cannot be placed because the descriptions are inadequate.

## TAUROSOMUS, gen. nov.

*Head* continuous with rostrum dorsally. frons very broad, its width three times the length of the small, broadly-ovate convex eye. *Rostrum* stout, its sides forming a continuous line with those of the head, narrowed to the scrobes and somewhat dilated at the genæ; dorsal area much narrower than the frons, the obtuse dorso-lateral carinæ curving strongly outwards at apex; scrobes short and deep, curving inwards, their upper margin at apex produced obliquely upwards into a short sharp point, the lower margin produced forwards into a long sharp horn in ♀, the processes being much shorter in ♂; lateral areas sloping convexly; epistome very short, the non-carinate hind margin forming a broad obtuse angle; mentum with six setæ. *Antennæ* squamose; scape not exceeding front margin of prothorax, comparatively slender but abruptly and very broadly clavate at apex; funicle stout, as broad as the basal half of the scape, joint 1 longer than 2, 3-7 transverse; club elongate-oval, the joints truncate. *Prothorax* rounded laterally, widest near the shallowly bisinuate base, which is much wider than the apex, which has a dense fringe of plumose scales all round its margin, postocular lobes absent, vibrissæ well developed. *Elytra* with prominent roundly rectangular shoulders. *Legs* without any tooth on the femora; anterior pairs of tibiæ with the external apical angle produced outwards, corbels of hind pair open; joint 3 of tarsi much shorter and only slightly wider than 2, the underside spongy only at the apex of the lobes.

Genotype: *Corigetus claviger* Fst.

An aberrant monotypic genus.

## CORIGETUS Desbr.

I agree with Voss (Senckenb. xix. 1937, p. 249) that this genus will probably have to be restricted to the genotype, *marmoratus* Desbr., which occurs in Siberia and China.

## HERCOMYCTERUS, gen. nov.

*Head* dorsally continuous with the rostrum; frons broad, wider than the greatest distance between the

scrobes ; eyes lateral, convex. *Rostrum* parallel-sided in the basal half, moderately dilated at the genæ ; dorsal area at base much narrower than the frons, the dorso-lateral carinæ curving strongly outwards at apex ; scrobes broad, curving strongly inwards behind ; lateral areas with an oblique curved costa partly enclosing the scrobe behind and running from the inner edge of the scrobe towards the middle of the eye ; epistome very short, its hind margin scarcely carinate and forming a broad curve ; buccal aperture very oblique, mentum with four setæ. *Antennæ* squamose ; funicle with joint 1 much longer than 2 ; club elongate, narrow. *Prothorax* sub-conical, widest at the deeply bisinuate base, the basal angles acute, the sides straight, the postocular lobes obsolete, the vibrissæ rather short and sparse. *Elytra* at the shoulders not very much wider than the prothorax, parallel. *Legs* with a much reduced femoral tooth, corbels of hind tibiæ entirely open, tarsal claws free.

Genotype : *Origetus trepidus* Faust.

*Origetus sellatocollis* Fst. also belongs to this genus, which is known only from Central Asia.

#### HYPSEDAPHUS, gen. nov.

*Head* continuous with the rostrum dorsally ; frons broad, wider than the greatest distance between the scrobes ; eyes lateral, convex. *Rostrum* narrowing gradually from base to antennæ, rather strongly dilated at the genæ ; dorsal area at base much narrower than the frons, the dorso-lateral carinæ curving strongly outwards at the apex ; scrobes broad, curving strongly inwards behind ; lateral areas with an oblique costa partly enclosing the scrobe behind and running in a curve from the inner margin of the scrobe towards the middle of the eye ; epistome very short, its hind margin scarcely carinate and forming a broad curve or wide obtuse angle ; buccal aperture very oblique, mentum with four setæ. *Antennæ* squamose ; funicle with joint 1 much longer than 2 ; club variable. *Prothorax* rounded laterally, the sides curving inwards at the base, which is not much wider than the apex, the postocular lobes obsolete, replaced by short vibrissæ. *Elytra* much wider at the roundly rectangular shoulders than the prothorax, the basal

margin obtusely elevated. *Legs* with a small femoral tooth, corbels of hind tibiae entirely open, tarsal claws free.

Genotype : *Corigetus exquisitus* Fst.

*Corigatus setulifer* Roitt. must also be placed here, and *C. crassicornis* Desbr. is provisionally included, though it has much thicker antennae, a smaller club, and no tooth on the femora. The genus is confined to Central Asia.

#### PARAMYCTER, gen. nov.

*Head* dorsally continuous with the rostrum, frons wider than the greatest width between the scrobes ; eyes large, round, almost flat. *Rostrum* stout, only slightly dilated at the genae ; dorsal area narrower at base than the frons, the dorso-lateral carinae straight and parallel from base to apex ; lateral areas not vertical, without any oblique carina ; scrobes broad, almost parallel, only slightly curved inwards behind ; epistome short, its carinate hind margin forming an obtuse angle that does not extend behind the antennae ; buccal aperture nearly vertical, mentum with four setae. *Antennae* comparatively short, squamose ; scape somewhat compressed and dorsally flattened ; funicle with joint 2 not longer than 1 ; club narrowly ovate, the joints truncate. *Prothorax* much wider at the deeply bisinuate base than at apex ; postocular lobes feeble, with short vibrissae. *Elytra* with the shoulders obliquely prominent. *Legs* with a small sharp femoral tooth, femora compressed at base ; tibiae with a more or less distinct mucro ; claws free.

Genotype : *Paramycter trivitticollis*, sp. n.

A second undescribed species is known, also from India. The genus may be recognized by the compression at the base of the femora and the parallel dorso-lateral carinae on the rostrum.

#### *Paramycter trivitticollis*, sp. n.

♀. Derm piceous to red-brown, with dense pale green scaling and brown markings above ; prothorax with three broad brown stripes of about equal width ; disk of elytra with variable brown mottling as far as stria 6 ; underside with dense pale green scales.



*Head* densely squamose, with a partly concealed narrow median stria; width of frons greater than the length of an eye; eyes large, round and almost flat. *Rostrum* stout, about as long as broad, parallel-sided in the basal half and only slightly dilated at the genæ; dorsal area broadly depressed, with a fine median carina near the apex only. *Antennæ* red-brown, densely squamose; scape stout, gradually widening from base to apex, with recumbent setæ, the upper surface somewhat flattened; funicle with joints 1 and 2 equal, 3 longer than 4, 4-7 subequal, longer than broad. *Prothorax* transverse, subconical, with the sides straight, much wider at base than apex, the base deeply bisinuate, the basal angles acute (seen from above), the median lobe acuminate; dorsum with rather distant punctures that are scarcely visible through the scaling, each containing a short appressed seta, with a rounded impression on each side behind the middle, the posterior half of the median dark stripe (including the basal lobe) obtusely tectiform and partly bare, owing to the scales being much smaller, narrower and sparser, the punctures also being much fewer and smaller. *Scutellum* small, transverse, with dense green scaling. *Elytra* with the prominent oblique shoulders very slightly projecting laterally, broadly ovate, widest behind the middle; the distinct striæ partly covered by scaling, most of the punctures showing through as narrow slits; the intervals wide, gently convex, with dense contiguous convex scales and irregular short spatulate appressed setæ. *Legs* red-brown, with dense pale green or coppery scales.

*Length* 6.0-6.7 mm., *breadth* 3.0-3.1 mm.

BENGAL: Sikkim, Gopaldhara, Rungbong Valley, 4 ♀, iv. 1915 (*H. Stevens*).

### THLIPSOMERUS, gen. nov.

*Head* dorsally continuous with the rostrum; frons varying greatly in width but always about equal to the greatest distance between the scrobes; eyes almost flat. *Rostrum* varying in shape, about as long as broad; dorsal area narrower at base than the frons, the dorso-lateral carinæ curving strongly outwards apically; lateral areas without an oblique parina; scrobes broad, curving

inwards behind; epistome very short, its hind margin curved, obtusely angulate or transverse, and immediately behind it (in the typical forms) two large bare foveæ; mentum with four setæ. *Antennæ* squamose or setose; scape gradually widening from base to apex; funicle with the two basal joints subequal, the distal ones longer than broad. *Prothorax* of variable shape, moderately bisinuate at the base, postocular lobes well developed. *Elytra* with the shoulders roundly rectangular; the striae partly covered with scaling but the punctures showing through, the alternate intervals usually more or less raised. *Legs* with a small femoral tooth; corbels of hind tibiae entirely open, claws free.

Genotype: *Cyrtepistomus subcosticollis* Mshl. 1943.

Three other undescribed Indian species are known, and *Cyphicerus deplanatus* Fst. and *Cyrtepistomus glebosus* Mshl. may also be placed here provisionally. It is not a very homogeneous assemblage and is likely to be divided when more species are known, but it may be distinguished by the impressed and widened bases of the femora from all other genera of Cyphicerini except *Paramycter*, g. n., which differs *inter alia* in having the dorso-lateral carinae of the rostrum quite straight and parallel.

#### EPITYNUS, gen. nov.

*Head* with the frons comparatively narrow, its width not greater than the length of an eye, with a very large frontal fovea; eyes large, almost round and flat. *Rostrum* stout, narrower at base than the head, the dorsal outline distinctly curved and continuous with the frons, the dorsal area at its base as wide as the frons, the dorso-lateral carinae sharply overhanging the lateral areas and curving outwards at apex; scrobes short, only slightly curved, ill-defined behind, fully visible from above; epistome short, its hind margin forming a broad curved obtuse angle; buccal aperture very oblique, mentum with four setæ. *Antennæ* setose; scape curved, gradually clavate; funicle with the distal joints longer than broad; club elongate, fusiform, the joints truncate. *Prothorax* rounded laterally, the shallowly bisinuate base only slightly wider than the apex, the postocular lobes moderate with rather sparse vibrissæ. *Elytra* with rounded

shoulders, dehiscent at apex, the intervals without apparent setæ. *Legs* with a small triangular femoral tooth, corbels of hind tibiæ open, claws free.

Genotype : *Epixynus calvus*, sp. n.

Another monotypic genus.

*Epixynus calvus*, sp. n.

♂♀. Derm black, rather shiny, bare, except for a very few narrow white scales in the striae towards the sides and apex of the elytra, underside with sparse short pale setæ.

*Head* with shallow punctures which become longitudinally confluent laterally; frons flattened, but above the level of the eyes, with a very large deep median fovea. *Rostrum* narrowing very slightly from base to scrobes, rather strongly dilated at the genæ, dorsal area broad, almost flat transversely, strongly punctate, with a low narrow median carina that is usually obsolete on the basal half; the lateral areas flat longitudinally and more or less striate. *Antennæ* black to piceous, with short recumbent pale setæ, scape gradually clavate, rather rugosely punctate, funicle with joint 2 slightly longer than 1, 3 and 4 subequal, 5-7 a little shorter and subequal. *Prothorax* transverse, slightly rounded laterally, widest behind the middle, dorsum strongly and closely punctate, the punctures becoming confluent behind the middle, without any smooth median line and with a shallow sublateral impression on each side behind the middle; the setæ extremely short and appressed. *Scutellum* subquadrate, bare. *Elytra* much broader at the rounded shoulders than the base of the prothorax, parallel from there to behind middle in ♂, a little broader behind in ♀, the shallow striae with strong close punctures; the feebly convex intervals broader than the punctures near the suture, narrower laterally, with numerous small irregular punctures and without setæ. *Legs* black or piceous, rugosely punctate, except on the clavate part of the femora, which is shiny and impunctate; anterior pairs of tibiæ sinuate at the base.

*Length* 5.0-6.5 mm., breadth 2-3 mm.

INDIA : Chota Nagpur, Barway, 10 ♂, 8 ♀ (*P. Cardon*).

## CNODOSTETHUS, gen. nov.

*Head* dorsally continuous with rostrum; eyes large, broadly ovate, almost flat. *Rostrum* stout, almost as wide at base as the head, not dilated at apex; dorsal area at base much narrower than the frons, the dorso-lateral carinae nearly straight and diverging from base to apex; scrobes not much curved, ill-defined behind; epistome with its carinate margin forming an obtuse angle that extends back to the level of the antennae; *mentum* with four setae. *Antennae* setose; scape nearly straight, clavate; funicle with joint 2 longer than 1, the distal joints longer than broad; club elongate, elliptical. *Prothorax* subconical, widest at the strongly bisinuate base, the median lobe of which is rounded, the postocular lobes well developed. *Elytra* much wider at the oblique shoulders than the prothorax, widest behind the middle, dehiscent at the apex, the intervals with irregular setae. *Legs* with a small sharp femoral tooth, corbels of hind tibiae with a bare inner carina, claws free. *Sternum* with a high laminate longitudinal process behind the front coxae; intercoxal process of mesosternum broader than the apex of the antennal scape.

Genotype: *Cnodostethus seminudus*, sp. n.

Based on a single species from Java. The curious process on the prosternum may prove not to be a generic character, but the width between the median coxae is very unusual in this tribe.

*Cnodostethus seminudus*, sp. n.

♂♀. Derm black, rather shiny; upper surface devoid of scales except for a yellowish band on the median basal lobe of the pronotum; the sides of the head, prothorax, sternum, and of the elytra beyond striae 5 and on the declivity, with dense creamy white scales.

*Head* varying from strongly striolate to nearly smooth and impunctate; frons wider than the length of an eye, with a median fovea. *Rostrum* slightly wider at base than at apex, with the sides sinuate; dorsal area regularly widening distally, almost flat, with obsolescent punctures and a low median carina, which is sometimes flattened on the basal half; the lateral areas striolate. *Antennae* red-brown; scape rather slender, gradually clavate, with

very sparse short recumbent setæ; funicle with joint 2 much longer than 1, 3 a little longer than 4, 5-7 shorter and equal. *Prothorax* nearly twice as broad as long, much wider at base than at apex, the sides straight; dorsum with the punctures very sparse and small laterally, larger and closer on the disk, and becoming rugosely confluent towards the base, and with a very faint impression on each side near the base. *Scutellum* subquadrate, bare, rugulose. *Elytra* with the shallow striæ containing round separated punctures, the intervals nearly flat, broader than the punctures, transversely rugulose: the scales on the sides and apex nearly round; the irregular setæ on the disk very sparse, very short and appressed, those on the squamose areas longer and subrecumbent. *Legs* piceous, rugulose and sparsely setose.

*Length* 6.5 mm., *breadth* 3 mm.

JAVA: Soekaboemi, 2 ♀, 2. iv. 1909 (*G. E. Bryant*); N.W. Preanger, Gunong Gedeh, 1 ♂, 1 ♀ (*I. Z. Kannejieter*)

#### CYPHICERINUS Mshl.

A recent revision of this genus (*Proc. R. Ent. Soc. Lond.*, B, xi. 1942, p. 124) comprised nine species from India, Burma and the Philippines; but *Cyrtepistomus pannosus* Mshl. must now be added to it, and two undescribed species are also known.

#### ASYNETUS, gen. nov.

Head dorsally continuous with the rostrum; eyes large, broadly ovate, only slightly convex. *Rostrum* stout, slightly narrower at base than the head, moderately dilated at apex; dorsal area at base as broad as the frons, almost flat, with a low squamose transverse ridge behind the epistome, the dorso-lateral carinæ nearly straight and diverging slightly towards apex; scrobes short, almost straight, not enclosed behind; epistome with its carinate hind margin forming a wide obtuse angle, the sides parallel; buccal aperture very oblique, mentum with four setæ. *Antennæ* with joint 2 of the funicle equal to or longer than 1; club elongate, with the joints truncate. *Prothorax* rounded laterally, widest behind middle, narrower at apex than at the bisinuate base, postocular lobes strongly developed. *Elytra* much wider at the rounded shoulders than the prothorax, widest

behind middle in both sexes. *Legs* with a small sharp femoral tooth, corbels of hind tibiae open, claws free.

(Genotype: *Asynetus furvus*, sp. n.)

Eight other undescribed species are known from Siam and Borneo.

*Asynetus furvus*, sp. n.

♂♀. Derm black, with dense brown scaling, the elytra with vague darker spots in the striae due to reduced scaling.

*Head* with the striolation concealed by scaling; width of the frons greater than the length of an eye. *Rostrum* as long as broad, of equal width at base and apex, the sides rather deeply sinuate; dorsal area densely squamose right up to the epistome, with a fine low median carina; lateral areas with a shallow sulcus from scrobe to eye. *Antennae* piceous; scape only slightly curved, gradually widening from base to apex, with narrow scales and short recumbent setae; funicle with joint 2 distinctly longer than 1, 3 slightly longer than 4, 5-7 shorter and equal; club of ♀ elongate ovate, that of ♂ much longer, joint 3 being very long and narrower than 2. *Prothorax* transverse, widest behind middle, the median lobe of the base broadly arcuate, the apical margin feebly sinuate in the middle; dorsum with the dense coarse punctures entirely hidden by scales and short recumbent spatulate setae, with a shallow impression on each side behind the middle. *Scutellum* subquadrate, squamose. *Elytra* widening from the rounded shoulders to behind the middle; the shallow striae with close round punctures that are partly covered by scales; the intervals much wider than the striae, flat, with numerous short recumbent spatulate setae, the scales small and round. *Legs* black, with dense brownish scales.

*Length* 5.5-6.5 mm., *breadth* 2.5-3.0 mm.

BURMA: 3 ♂ (*A. K. W. Downing*); Maymyo, 4 ♂, 3 ♀, v. 1910 (*H. L. Andrewes*—type), 2 ♀, iii. 1918 (*A. G. R.*).

AFROPHYTOSCAPHUS Hust.

*Afrophytoscapus* Hustache, Ann. & Mag. N. H. (10) xviii. 1936, p. 443.

This African genus now comprises *variabilis* Hust. (genotype) (Abyssinia), *myersi* Mshl. 1939 (Anglo-Egyptian

Sudan), and *Phyllobius hirtellus* Reiche (Abyssinia). It extends to Senegal, and two undescribed species are known.

*PIEZOPHREYS*, gen. nov.

*Head* dorsally separated from the rostrum at most by a very slight impression; frons very narrow, not more than half as wide as the greatest distance between the scrobes; eyes subdorsal, large, nearly round, almost flat. *Rostrum* about as long as broad, comparatively narrow and parallel-sided in the basal half, strongly dilated at the genæ; dorsal area normally narrower at base than the frons, rarely as broad, the dorso-lateral carinæ curving strongly outwards at apex; lateral areas without an oblique carina; scrobes broad, curving inwards behind; epistome short, steeply declivous, its carinate hind margin almost or quite transverse; buccal aperture oblique, mentum with four setæ. *Antennæ* setose; scape rather slender, curved, gradually clavate, with recumbent setæ; funicle with joint 2 very slightly longer than 1. *Prothorax* only feebly rounded laterally, not or slightly narrower at apex than at the deeply bisinuate base, postocular lobes well developed. *Elytra* comparatively narrow, with prominent, roundly rectangular shoulders, the intervals with a single row of short erect setæ. *Legs* with a small sharp femoral tooth; corbels of hind tibiæ entirely open; claws free.

Genotype: *Piezophrys hebes*, sp. n.

The rather narrow form, the very narrow frons, strongly dilated rostrum and deeply bisinuate pronotum, give this genus a rather characteristic facies. Four other undescribed species are known from India.

*Piezophrys hebes*, sp. n.

♂♀. Derm red-brown to piceous, with dense pale brown scaling; elytra with an indefinite broad oblique patch of dark brown scales behind the middle between striæ 2 and 6, and immediately behind it an ill-defined common V-shaped grey band.

*Head* with the dense scaling concealing the sculpture; frons a little wider than the base of the dorsal area on the rostrum but narrower than the length of an eye

(2 : 3) ; eyes touching the prothorax, with a line of pale scales on their lower edge. *Rostrum* very slightly longer than its apical width ; dorsal area narrowing slightly behind, flat or very shallowly impressed, without any median carina. *Antennæ* ferruginous ; funicle with joint 3 very slightly longer than 4, 5-7 equal, longer than broad. *Prothorax* nearly as long as broad (8 : 9), feebly rounded laterally, widest at middle, slightly narrower at apex than at base ; dorsum with the sculpture concealed, except for a shallow round impression on each side behind middle. *Elytra* of ♂ parallel from the rectangularly rounded shoulders to beyond middle a little wider behind middle in ♀ ; the shallow striae partly covered by scaling, but the small punctures visible through it ; the intervals broad, of equal height, each with a row of short pale truncate erect setæ. *Legs* ferruginous, with light brown scaling.

*Length* 4.5-5.0 mm., breadth 2 mm.

BENGAL : Sikkim, Darjiling, 1 ♀ (*Harmand*---type) ; Kurseong, 1 ♂.

#### CEODOPHRYS Mshl.

*Ceodophris* Marshall, Ann. & Mag. N. H. (11) viii. 1941, p. 361.

This genus was proposed for five species from Burma and China, and three undescribed Burmese species are also known.

#### CYRTEPISTOMUS Mshl.

In the 'Catalogus' six species are listed in this genus. Of these, *gracilicornis* Fst. has already been removed as the genotype of *Doliophron* Mshl. 1941, and it has been mentioned above that *pannosus* Mshl. must be transferred to *Cyphicerinus* ; finally, *necopinus* Fst. proves to belong to the genus *Cyphicerus*.

*Cyrtepistomus pini* and *glebosus* Mshl. (Ann. & Mag. N. H. (9) xiii. 1924, pp. 285, 287) were omitted from the Catalogue ; the former was rightly placed in this genus, the latter must go into *Thlipsomerus*, g. n. (as mentioned above), as also must *C. subcosticollis* Mshl. 1943. *C. bardus* Mshl. 1941, and the Japanese *Mylocerus castaneus* Roel. bring the number of described species up to six, and quite a dozen undescribed species are known.



**PHRIXOPOGON Mshl.**

*Phrixopogon* Marshall, Ann. & Mag. N. H. (11) viii. 1941, p. 366.

This genus was proposed for two Chinese and four Burmese species, all of which have 6-8 setæ on the mentum, but various species have been found having only 4 setæ on the mentum which cannot be separated from them generically.

*Corigetus nobilis* Est. must now be included here, and more than twenty undescribed species are also known.

**MYLLOCEROPSIS Aur.**

Only a single species from Tanganyika has so far been included in this purely African genus, but 6 or 7 undescribed species are known, ranging from Kenya to Nigeria.

**DOLIOPHRON Mshl.**

*Doliophron* Marshall, Ann. & Mag. N.H. (11) viii. 1941, p. 365.

Based on two species from India and Burma, and now some nine undescribed species are known from the same countries.

**HILAUS, gen. nov.**

*Head* dorsally continuous with the rostrum; frons flat transversely, its width equal to or greater than the width of an eye, the fine median stria almost concealed; eyes longitudinal, broadly ovate, nearly flat. *Rostrum* longer than broad, nearly as wide at the base as the head, of equal width at base and apex with the sides shallowly sinuate; the dorsal area narrower than the frons, its margins parallel in the basal three-fourths, diverging apically; lateral areas steeply declivous; margin of the epistome sharply carinate, forming a right angle and extending to a little behind the antennæ; scrobes short, dorsal; mentum with four setæ. *Antennæ* rather slender, densely squamose throughout; scape gradually clavate; funicle with joint 2 equal to or slightly longer than 1, distal joints longer than broad, 7 shorter than the basal joint of club, which is elongate fusiform. *Prothorax* widest at the deeply bisinuate base, the postocular lobes well developed. *Elytra* with the shoulders very oblique, widest behind the middle, the apices shortly and separ-

ately produced, the intervals with numerous irregular scale-like appressed setæ. *Legs* slender, with a small sharp femoral tooth; middle tibiæ somewhat curved, corbels of hind tibiæ containing a low bare carina just within the outer row of setæ; claws free.

Genotype: *Corigetus bidentulus* Fst.

Another undescribed species is also known. The genus is known only from India.

#### MEIONOPS Mshl.

In addition to the two Indian species described in 1917 another new species is now known, also from India.

#### CRINORRHINUS Mshl.

A recent revision of this genus (Proc. R. Ent. Soc. Lond., B, xi. 1942, p. 143) comprised ten species, their range covering India, Burma and Siam.

#### IX.—*The Foraminifera of the Funafuti Boring.*

By FREDERICK CHAPMAN (Melbourne, Australia).

THE borings carried out on the atoll of Funafuti in the Ellice group, under the auspices of the Coral Reef Committee of the Royal Society, during the years 1896 to 1898, yielded a mass of information which was published in a lengthy Report in 1904. The cores and their contained organisms were dealt with by G. J. Hinde, who, however, in the case of the Foraminifera, recorded as a rule the genera only, rarely mentioning the species. The list now given, hitherto unpublished, is based on identifications made by the present author when the material was first sliced and examined; it has been revised and the nomenclature brought up to date, using the classification of Chapman and Parr (1936). To facilitate comparison, the earlier names used in the report of 1904 are, if now changed, added in inverted commas in parenthesis. The recorded species were obtained from 130 consecutive samples, consisting of either core or

sandy detritus or both from the Main Boring (0-1114½ feet). The depth figures given in the list refer to these samples.

The whole of the prepared material, together with half of each piece of core, vertically sliced, was handed over to the British Museum (Natural History) in 1902. The remaining halves of the core-samples were deposited in the Geological Department of the University of Sydney.

For accounts of Foraminifera from the only other two deep bores into coral reefs, see Chapman, 1931 (Michaelmas Cay), and Cushman, 1942 (Heron Island, Great Barrier Reef).

Relative frequency :—v.c., very common ; c., common ; f., frequent ; r., rare ; v.r., very rare.

## Super-Family SPIRILLINOIDEA.

### Family Spirillinidæ.

Genus SPIRILLINA Ehrenberg, 1843.

*Spirillina decorata* Brady. 74', v.r.

*Spirillina tuberculolimbata* Chapman. 70', r. ; 74', v.r.

*Spirillina* sp. 497'-505', v.r.

### Family Nodosaridæ.

Genus LENTICULINA Lamarck, 1804. ("Cristellaria.")

*Lenticulina* cf. *articulata* Reuss. 74', v.r.

*Lenticulina* sp. 150'-160', v.r.

Genus MARGINULINA d'Orbigny, 1826.

*Marginulina glabra* d'Orbigny. 255', v.r. ? 468'-480', r.

### Family Bolivinidæ.

Genus BOLIVINA d'Orbigny, 1839.

*Bolivina robusta* Brady. 578'-598', f. ; 854'-866', f.

Genus LOXOSTOMUM Ehrenberg, 1854. ("Bolivina.")

*Loxostomum limbatum* (Brady). 330'-340', f.

Family **Heterohellicidæ.**

Genus **BOLIVINELLA** Cushman, 1927. (" *Textularia*.")

*Bolivinella folium* (Parker and Jones). 652'–660½', r.

Genus **SIPHOGENERINOIDES** Cushman, 1927. (" *Sagrina*.")

*Siphogenerinoides raphanus* (Parker and Jones). 74', v.r.

Family **Rotaliidae.**

Genus **DISCORBIS** Lamarck, 1804. (" *Discorbina*.")

*Discorbis globularis* (d'Orbigny). 340'–350', r.

*Discorbis patelliformis* (Brady). 74', r.

*Discorbis* cf. *rosacea* (d'Orbigny). 170'–180', v.r.

*Discorbis* cf. *rugosa* (d'Orbigny). 180'–190', v.r.

*Discorbis tuberculata* (Chapman). 74', v.r. ; 160', r. ;  
652'–660½', r. ; 691½'–698', r.

*Discorbis* cf. *valvulata* (d'Orbigny). 130'–140', v.r.

*Discorbis* sp. 30'–40', v.r. ; 280', r. ; 360'–370', r. ;  
578'–598', v.r. ; 603'–612', r. ; 670½'–691½', r. ;  
736'–748', r.

Genus **CYMBALOPORETTA** Cushman, 1928.

(" *Cymbalopora*.")

*Cymbaloporetta squamosa* (d'Orbigny). 210'–220', r. ;  
547'–555', r. ; 1060'–1066', c.

Genus **CYMBALOPORELLA** Cushman, 1927.

(" *Cymbalopora tabellæformis*.")

*Cymbaloporella tabellæformis* (Brady). 246'–250', v.r. ;  
637'–643', r.

Genus **EPONIDES** Montfort, 1808. (" *Pulvinulina*.")

*Eponides repandus* (Fichtel and Moll). 70', r. ; 652'–  
660½', r. ; 691½'–698', f. ; 1020'–1025', r.

*Eponides* sp. 457'–468', r. ; 637'–652', r.

Genus **ROTALIA** Lamarck, 1804.

*Rotalia* sp. 100', v.r.

Genus ANOMALINA d'Orbigny, 1826.

*Anomalina ammonoides* (Reuss). 360'-370', f.

*Anomalina semipunctata* Bailey). 166'-170'.

Genus ANOMALINELLA Cushman, 1927.

(" *Truncatulina*."

*Anomalinella rostrata* (Brady). 74', v.r.; 160', r.; 170'-190', r.; 220'-230', v.r.; 373½'-378½', r.; 517'-526', r.; 603'-613', r.; 624½'-637', c.; 643'-660½', r.; 670½'-691½', r.; 1075'-1082', r.; 1087'-1089', r.

Genus CIBICIDES Montfort, 1808. (" *Truncatulina*."

*Cibicides lobatulus* (Walker and Jacob). 983'-987', v.r.

*Cibicides ungerianus* (d'Orbigny). 280', r., 373½'-378½', f.

*Cibicides* sp. 100', v.r.; 567'-578', v.r.

Genus PLANORBULINELLA Cushman, 1927.

(" *Planorbulina*."

*Planorbulinella larvata* (Parker and Jones). 30'-40', v.r.; 70'-80', v.r.; 150'-160', v.r.; 547'-555', r.; 603'-612', r.; 782'-790', r.; 811'-822', f. to r.; 833'-844', c.; 854'-866', f.; 875'-890', v.r. to f.; 911'-936', c. to r.; 1040'-1053, r.; 1060'-1066', c.; 1075'-1082', c.; 1093'-1100', r.; 1107'-1114', f. and large.

*Planorbulinella* sp. 567'-578', v.r.; 822'-833', r.

Genus ACERVULINA Schultze, 1854. (" *Gypsina*."

*Acervulina inhaerens* Schultze. Frequent almost throughout the core; found in 45 samples from 0'-414½'.

*Acervulina inhaerens* Schultze var. *plana* Carter var. (" *Polytrema planum*." Frequent to very common almost throughout the core; found in 83 samples. This organism is one of the chief agents in binding together the loose reef material.

Genus GYPSINA Carter, 1877.

*Gypsina globulus* (Reuss). 70', r.; 100'-105', v.r.; 150'-160', v.c.; 180'-190', v.r.; 230'-235', v.r.;

265', v.r.; 373½'-378½', r.; 603'-612', f.; 643'-652', r.; 691½'-706', r.; 716'-748', f. to r.; 882'-890', v.r.; 991'-1007', v.c.; 1107'-1114', r.

*Gypsina vesicularis* (Parker and Jones). 20'-30', v.r.; 74', v.r.; 130'-140', v.c.; 166'-170', v.r.; 517'-546', r.; 603'-612', r.; 652'-660½', r.; 670½'-698', r.; 716'-736', r.; 891'-899', r.; 922'-936', r.; 946'-957', r.; 969'-973', r.; 1026'-1034', r.; 1060'-1066', f.

*Gypsina vesicularis* (Parker and Jones) var. *discus* Goës. 150'-160', r.; 517'-555', r.; 624½'-637', r.; 748'-798', v.c. to v.r.; 805'-815', f.; 833'-844', v.c.; 867'-874', f.; 882'-922', r. to f.; 937'-968', r.; 973'-983', r.; 991'-1007', c.; 1007'-1011', r.; 1026'-1034', f.; 1075'-1082', f.; 1093'-1100', f.; 1107'-1114', f.

(This variety was not met with in recent dredgings round Funafuti.)

*Gypsina vesicularis* (Parker and Jones) var. *monticulus* Chapman. 652'-660½', r.; 922'-936', r.; 1044'-1053', f.

*Gypsina vesicularis* (Parker and Jones) var. *squamiformis* Chapman. 180'-190', f.; 517'-526', r.; 603'-612', v.r.; 624½'-643', r.; 782'-798', r.; 969'-987', r.; 1020'-1025', v.r.; 1060'-1066', f.

(Common throughout lagoon dredgings.)

*Gypsina* sp. 170'-180', v.; 506'-517', r.; 567'-578', v.r.; 772'-781', v.r.

### Genus CARPENTERIA Gray, 1858.

*Carpenteria balaniformis* Gray. 75', f.

*Carpenteria monticularis* Carter. 0'-10', v.r.; 30'-40', f.; 120'-140', v.r.; 150'-160', v.r.; 270'-275', f.; 643'-652', v.r.; 670½'-691½', v.r.; 819'-822', r.; 911'-922', v.r.

*Carpenteria proteiformis* Goës. 150'-160', v.r.; 410'-420', r.; 452½'-457', f.

*Carpenteria raphidodendron* Moebius. 10'-40', r. to f.; 70'-80', f.; 100'-105', r.; 170'-180', f.; 290'-300', f.; 452½'-468', c. to r.; 517'-555', r.; 567'-598', f. to r.; 603'-612', r.; 624½'-652', f.; 716'-748', c. to r.; 782'-790', r.; 811'-815', r.; 822'-844', f.;

854'-866', f.; 875'-888', r.; 922'-936', r.; 946'-987', f. to r.; 1026'-1034', r.; 1044'-1053', r.; 1060'-1066', f.; 1107'-1114', f. (large).

An important reef-forming species.

*Carpenteria serialis* Chapman. 210'-220', v.r.; 637'-643', r.; 691½'-698', r.; 736'-748', r.; 899'-910', v.r.

*Carpenteria utricularis* Carter. 20'-30' (var.); 70'-80', v.r.; 100'-105', v.r.; 160', v.r.; 166'-180', v.r.; 517'-555', r.; 637'-652', r.; 937'-945', v.r.; 1093'-1100', r.

*Carpenteria* sp. Occurs in 38 samples between 109' and the bottom, usually v.r. or r., occasionally f.

#### Genus MINIACINA Galloway, 1933.

*Miniacina miniaceae* (Pallas). ("Polytrema miniaceum.")  
Found in 62 samples throughout the core; usually r., occasionally f. or v.c.

*Miniacina miniaceae* (Pallas) var. *alba* Carter. 70', v.r.; 74', v.r.; 75', v.r.; 120'-130', r.; 150'-160', r.; 166'-170', f.; 220'-230', f.; 517'-526', r.; 547'-555', v.c.; 881', c.; 1026'-1034', f.; 1089'-1093', r.; 1107'-1114', f.

#### Genus AMPHISTEGINA d'Orbigny, 1826.

*Amphistegina lessonii* d'Orbigny. Common throughout the bore in most of the samples. Forms with thick tests, which at the present day are confined to shallow water, occur in numerous samples, and from 652'-1075' the tests are invariably thick.

#### Genus CALCARINA d'Orbigny, 1826.

*Calcarina defranciai* d'Orbigny. 360'-370', r.; 370'-373', r.; 547'-555', r.; 822'-833', f.; 845'-853', f.; 867'-874', f.; 882'-890', v.r.; 911'-922', r.; 946'-957', r.; 1060'-1066', f.; 1075'-1082', c.

*Calcarina hispida* Brady. In 40 samples between 210' and the bottom, r. to v.c.

## Genus BACULOGYPSINA Sacco, 1893.

*Baculogypsina sphærulata* (Parker and Jones). (" *Tinoporos baculatus*." ) 0'-10', c. ; 90'-100', f. ; 120'-140', f. ; 150'-160', f. ; 166'-170', f. ; 240'-245', f. ; 370'-373', f.

## Family Orbullinidæ.

## Genus GLOBIGERINA d'Orbigny, 1826.

*Globigerina bulloides* d'Orbigny. 100', f. ; 290'-300', f. ; 370'-373', r. ; 624½'-643', f. ; 691½'-698', f. ; 716'-736', f. ; 819'-874', f. ; 946'-957', r. ; 1060'-1066', f. ; 1093'-1100', f.

*Globigerina conglobata* Brady. 20'-30', f. ; 150'-160', r. ; 170'-190', f. to r. ; 200'-210', r. ; 373½'-378¼', f. ; 567'-578', f. ; 603'-612', f. ; 624½'-637', f. ; 643'-698' f. to r. ; 716'-771', f. ; 805'-810', f. ; 854'-866', f. ; 1107'-1114', f.

*Globigerina* sp. 190'-200', v.r. ; 210'-220', f. ; 260', r. ; 373½'-378¼', r. ; 578'-598', f.

## Genus GLOBIGERINOIDES Cushman, 1927.

(" *Globigerina*," pars.)

*Globigerinoides sacculifera* (Brady). 736'-748', f. ; 882'-890', v.r. ; 946'-957', v.r.

## Genus GLOBIGERINELLA Cushman, 1927.

(" *Globigerina*," pars.)

*Globigerinella æquilateralis* (Brady). 340'-350', r.

## Family Nummulitidæ.

Genus NONION Montfort, 1808. (" *Nonionina*." )

*Nonion depressulum* (Walker and Jacob). 875'-880', r. ; 882'-890', r.

*Nonion umbilicatum* (Walker and Jacob). 130'-140', r. ; 290'-300', r.

*Nonion* sp. 452½'-457', v.r. ; 736'-748', r.

## Genus HETEROSTEGINA d'Orbigny, 1826.

*Heterostegina depressa* d'Orbigny. In 72 samples from 70' to the bottom, f. to v.c., occasionally r.



Genus CYCLOCYPEUS Carpenter, 1856.

*Cyclocypeus carpenteri* Brady. 567'–598', f. ; 652'–748', f. (forms A and B) ; 763'–771', f. ; 1026'–1034', r. ; 1040'–1044', f. ; 1072'–1075', v.r.

Super-Family AMMODISCOIDEA.

Family OPHTHALMIDIDÆ.

Genus OPHTHALMIDIUM Zwingli and Kübler, 1870.

*Ophthalmidium* sp. 811'–815', v.r. ; 1060'–1066', v.r.

Genus NUBECULARIA Defrance, 1825.

*Nubecularia lucifuga* Defrance. 0'–10', v.r.

*Nubecularia* sp. 340'–350', r.

Family MILLIOLIDÆ.

Genus QUINQUELOCULINA d'Orbigny, 1826.

(" *Miliolina*," pars.)

*Quinqueloculina bosciana* d'Orbigny. 637'–643', v.r.

*Quinqueloculina* cf. *polygona* d'Orbigny. 220', r.

*Quinqueloculina subrotunda* (Montagu). 74', v.r. , 571'–598', r. ; 624½'–637', v.r. : 922'–936', r. ; 1060'–1066', c. ; 1107'–1114', c.

*Quinqueloculina* sp. 643'–660½', v.r. ; 782'–790', v.r. ; 1093'–1100', r.

Genus SPIROLOCULINA d'Orbigny, 1826.

*Spiroloculina* cf. *arenaria* Brady. 624½'–637', v.r.

*Spiroloculina grata* Terquem. 120'–130', r. ; 791'–798', r. ; 881', v.r.

*Spiroloculina* sp. 110'–120', v.r. ; 410'–420', r. ; 637'–652', v.r. ; 748'–763', r. ; 833'–844', r.

Genus SCHLUMBERGERINA Munier Chalmas, 1882.

(" *Miliolina*," pars.)

*Schlumbergerina alveoliniformis* (Brady). 487'–505', v.r.

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Genus TRILOCULINA d'Orbigny, 1826.

(" *Miliolina*," pars.)

*Triloculina circularis* Bornemann. 90'-100', v.r. ; 1026'-1034', r.

*Triloculina oblonga* (Montagu). 100', v.r. ; 1060'-1066', c.

Genus PYRGO DeFrance, 1824. (" *Biloculina*.")

*Pyrgo* sp. 782'-790', v.r.

### Family Soritidæ.

Genus PENEROPLIS Montfort, 1808.

*Peneroplis pertusus* (Forskål). 854'-866', f.

Genus AMPHISORUS Ehrenberg, 1840.

(" *Orbitolites*," pars.)

*Amphisorus hemprichii* (Ehrenberg). 637'-660½', v.c. ; 748'-771', f. ; 782'-798', f. to r. ; 811'-818', r. ; 833'-853', f. to r. ; 881'-922', f. to r. ; 946'-973', r. to f. ; 983'-987', r. ; 991'-1007', r. ; 1026'-1034', r. ; 1060'-1066', r. ; 1072'-1075', r. ; 1087'-1089', f. ; 1107'-1114' 6", .

Genus SORITES Ehrenberg, 1840.

(" *Orbitolites*," pars.)

*Sorites marginalis* (Lamarck). Frequent almost throughout the boring ; in 48 samples.

Genus MARGINOPORA Blainville, 1830.

(" *Orbitolites*," pars.)

*Marginopora vertebralis* Blainville. (" *Orbitolites complanata*." ) Form A, the reproductive (budding) stage, occurs only near the base of the bore at 882'-890', 1011'-1015', and 1093'-1114' 6". This form was found in some abundance in the lagoon beach at Funafuti, but not in dredgings around the atoll. Form B (microspheric stage) was found in the cores throughout.

Family Alveolinellidæ.

Genus BORELIS Montfort, 1808. ("Alveolina," pars.)

*Borelis melo* (Fichtel and Moll). 782'–790', r.

(Found in tropical seas at no greater depth than 40 fathoms (240 feet).)

(Genus ALVEOLINELLA H. Douvillé, 1906.

("Alveolina," pars.)

*Alveolinella quoyi* (d'Orbigny). 652'–660½', r.; 716'–748', c. to r.; 881', r.

Family Lituolidæ.

(Genus PLACOPSILINA d'Orbigny, 1850.

*Placopsilina cenomana* d'Orbigny. 20'–30', v.r.; 30'–40', v.r.; 782'–790', r.

Genus HADDONIA Chapman, 1898.

*Haddonia torresiensis* Chapman. 0'–10', v.r.; 748'–763', r.; 922'–936', f.; 973'–987', f. to r.

Genus BDELLOIDINA Carter, 1877.

*Bdelloidina aggregata* Carter. 736'–748', v.r.

Family Textulariidæ.

Genus TEXTULARIA Defrance, 1824.

*Textularia agglutinans* d'Orbigny. 170'–180', v.r.

*Textularia conica* d'Orbigny. 1093'–1100', r.

*Textularia gramen* d'Orbigny. 567'–578', v.r.; 637'–643', r.; 691½'–698', r.; 782'–790', r.; 891'–899', f.; 1040'–1044', r.

*Textularia rugosa* (Reuss). 160', r.; 280', v.r.; 373½'–378½', r.; 637'–643', r.; 748'–763', r.; 782'–798', r.; 805'–810', v.r.; 969'–973', r.; 1020'–1025', v.r.; 1087'–1089', r.; 1093'–1100', r.; 1107'–1114' 6", r.

*Textularia sagittula* Defrance var. *fistulosa* Brady. 74', v.r.

*Textularia siphonifera* Brady. 270'–275', v.r.

*Textularia* sp. 410'-420', r.; 452½'-468', r.; 506'-517', r.; 652'-660½', v.r.; 833'-844', r.; 881', v.r.; 891'-910', r.; 922'-936', r.; 969'-973', r.; 1026'-1034', r.; 1060'-1066', v.r.

#### Family Valvulinidae.

Genus VALVULINA d'Orbigny, 1826.

cf. *Valvulina* sp. 1007'-1011', v.r.

#### Family Verneuilinidae.

Genus VERNEUILINA d'Orbigny, 1840.

*Verneuilina* sp. 603'-612', v.r.; 643'-652', r.

Genus GAUDRYINA d'Orbigny, 1839.

*Gaudryina rugosa* d'Orbigny. 670½'-691½', v.r.

*Gaudryina* sp. 578'-598', v.r.; 1011' 1015', r.

#### *Geological and Bathymetrical Deductions from Organisms occurring in the Boring.*

The Royal Society's report drew no general conclusions from the facts yielded by the investigations of the boring at Funafuti. Sollas, however, in 1905 (p. 130) pointed out that the evidence led to but one conclusion, namely that this atoll at least had been formed during a subsidence of the foundation on which it rests. The present writer has also urged that the organisms in the core support Darwin's theory of subsidence (Chapman, 1941). Hinde, indeed, who studied the corals, found shallow-water reef-building corals in their position of growth at the very base of the core (see also H. D. Thomas and W. W. Watts in discussion on Chapman, 1941). The green calcareous alga *Halimeda* has a zonal range, according to A. E. Finckh, of 30-270 feet on the ocean side at Funafuti; it occurs throughout the main boring down to 1114 feet.

The Foraminifera point in the same direction. One of the strongest indications of subsidence is the occurrence of comparatively large *Marginopora vertebralis* in its reproductive stage in the lower part and at the very base of the boring. In this stage *Marginopora* is now found only in shallow-water pools at Funafuti and on other coral reefs. The shallow-water form of *Amphistegina lessonii* with thick tests is found down to 1075 feet in the boring,

and other species now living round Funafuti in comparatively shallow water, which occur at greater depths in the core, include *Alveolinella quoyi*, *Borelis melo*, *Calcarina hispida*, and *Heterostegina depressa*. (See also Chapman, 1902 a, table on pp. 397-407.)

The Foraminifera (Chapman, 1900, 1901, 1902 a) and also the Ostracods (Chapman, 1902 b) found living round Funafuti show no marked specific differences from those recognized even in the deepest part of the boring, in which, moreover, no Tertiary foraminifera have been found. There has merely been some variation in abundance of some of the species, and the same applies to the corals, some of which are now absent from the immediate neighbourhood. Thus the Funafuti limestones are probably not older than Early Pleistocene.

Though Darwin recognized the contribution made to "coral" reef building by other organisms, especially nullipores, shells, echinoids and the excrement of fishes and holothurians, and saw the importance of cementing and infilling from solution, he gives no indication that he realized the immense importance of the Foraminifera, and especially of their encrusting, infilling and binding functions (cf. *Acervulina inhaerens* var. *plana*). The corals especially are, bound together by encrusting and adherent Foraminifera of rapid growth, such as *Acervulina* and *Carpenteria*, and this supports other evidence that the boring did not pass through a talus bank.

The nature of the sediments and their contained organisms indicate that the rocks of the bottom 50 feet of the core accumulated under shallow to littoral conditions. This phase was succeeded by some subsidence, though not below the limit of reef-building corals, followed by a slow phase of accumulation and shallowing (cores from about 1050 to 750 feet). More rapid subsidence followed, the deeper water allowing the accumulation of about 200 feet of foraminiferal sand with few corals (about 750 to 550 feet, with a brief shallow phase at 660 feet). The remainder of the core, up to the latest coral beach, represents oscillations between shallow and deeper water, indicated respectively by the prevalence either of reef corals or of deeper-living foraminifera. At about 375 feet the thick-tested Amphisteginæ (shallow forms) are crowded at all angles with no sign of sorting by currents, suggesting an æolian accumulation.

Subsidence therefore was a vital factor in the accumulation of the vast thickness of coral and other organic debris seen at Funafuti.

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X.—*Notes on Eocene Homoptera from the Isle of Mull, Scotland.* By FREDERICK E. ZEUNER, D.Sc., British Museum (Natural History).

### A.

#### Family Cicadidae.

##### Subfamily TETTIGARCTINÆ Myers.

##### *Eotettigarcta scotica*, n. g., n. sp.

1887. Cercopid insect: Gardner, Quart. J. geol. Soc. Lond. xliii p. 299, pl. xiii. fig. 9.

1941. *Platypleura* sp. indet.: Zeuner, Ann. Mag. nat. Hist. (11) vii. p. 88.

*Holotype*.—British Museum (Natural History), In. 38883.

*Distribution*.—Eocene, interbasaltic plant-beds : Ardtun Head, Isle of Mull, Scotland.

*Parts known*.—Hind wing, probably left ; anal lobe missing, apex damaged.

*Measurements*.—Total length (from figure, Gardner, 1887), about 23 mm. ; preserved, 20.2 mm. Maximum width, 10.8 mm.

*Description*.—(Comparison with *Tettigarcta* in brackets.) Hind wing broad, about twice as long as wide (about  $2\frac{1}{4}$  in *T.*). Fore margin from a short distance beyond the wing-catch, apex and distal portion of hind margin dark. Dark zig-zag patch covering all cross-veins between  $R_{2+3}$  and *Cu* 1a.

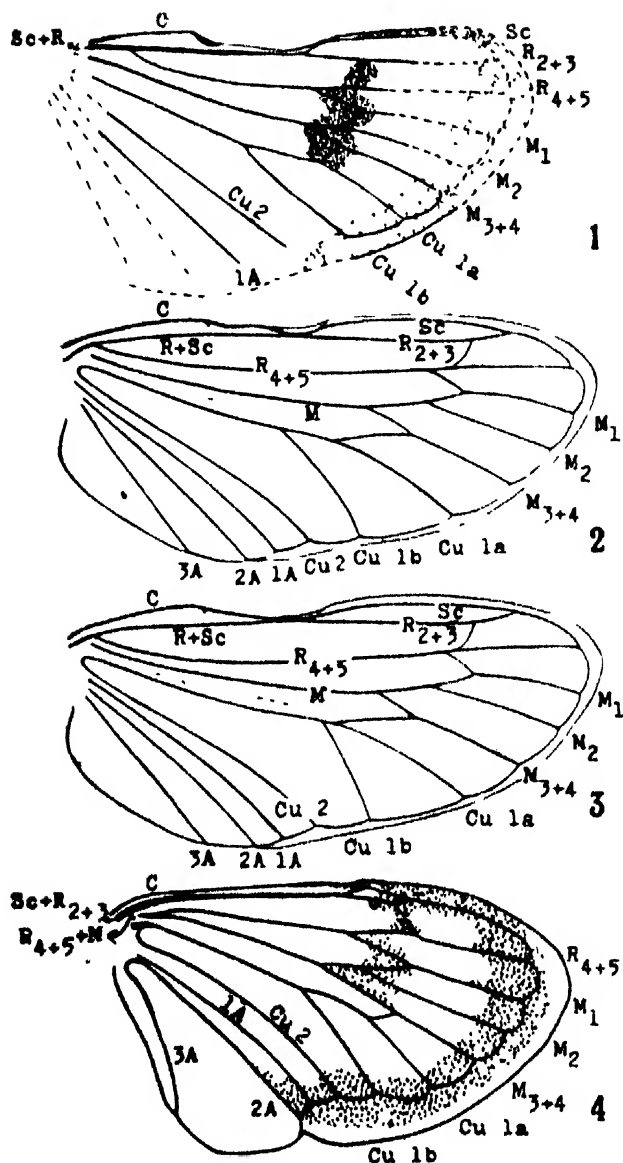
Venation closely resembling that of *Tettigarcta* White. *Sc* and  $R_{2+3}$  forming a large cell beyond the wing-catch. Cross-vein between  $R_{2+3}$  and  $R_{4+5}$  beginning from the latter and rising to the former (the reverse is the case in the Cicadinae). Cross-vein between  $M_{3+4}$  and *Cu* 1a short and almost at right angles with *Cu* (long and almost in straight line with *Cu* in *T.*).

*The fossil specimen*.—The rediscovery of the specimen which, at the time of my paper on the Mull fauna (1941) was regarded as lost, has necessitated the correction of the systematic position of this cicada, with results as unexpected as they are interesting.

The specimen was detected by Mr. W. N. Edwards on a large slab with leaves of *Cercidiphyllum* and *Quercus* (reg. V. 25226), from which it has since been detached. After the figure published in 1887 had been drawn, some student made an attempt at improving the specimen by means of a chisel. Unfortunately, the wing tip was lost as a result, but the important features of the venation are still preserved, and the pattern of the apex can be deduced from Gardner's figure.

Judging by the figure alone, the specimen exhibited a striking resemblance to several species of *Platypleura* Ann. & Serv. (Cicadinae), in the pattern as well as venation, so that there was no reason to doubt the fossil's affinity to this genus.

The examination of the specimen has revealed a venation which, in my opinion, proves close relationship with the south-east Australian genus *Tettigarcta* White. This genus constitutes the subfamily Tettigarctinae Myers



- Fig. 1.—*Eotettigarcta scotica*, n. g., n. sp., Holotype, British Museum (Nat. Hist.), In. 38883. Hind wing, total length, about 23 mm. Eocene: Mull, Scotland.
- Fig. 2.—*Tettigarcta tomentosa* White. Recent, south-east Australia. Hind wing. W. E. China del.
- Fig. 3.—*Tettigarcta crinita* Distant, Recent, south-east Australia. Hind wing. W. E. China del.
- Fig. 4.—*Platyleura wahlbergi* Stål. Recent. South Africa. Hind wing.



(1929) of the Cicadidæ. Its primitive characters have aroused interest before, and *T. tomentosa* White has recently been monographed by J. W. Evans.

*The hind wing of Tettigarcta.*—The venation of the hind wing of *Tettigarcta* has been studied but little, though there are several striking differences compared with the Cicadinae. They are illustrated in figs. 2 and 3 (*Tettigarcta*) and fig. 4 (*Platypleura*, Cicadinae) and summarized in the following table :

<i>Tettigarctinae.</i>	<i>Cicadinae.</i>
(1) <i>C</i> : independent of <i>R</i> + <i>Sc</i> between base and wing-catch*.	Fused with <i>R</i> + <i>Sc</i> .
(2) <i>Sc</i> †: independent of, and forming cell with, <i>R</i> <sub>4+5</sub> beyond wing-catch.	Completely fused with <i>R</i> <sub>2+3</sub> .
(3) radial cross-vein: forming branch of <i>R</i> <sub>4+5</sub> .	Forming branch of <i>R</i> <sub>2+3</sub> .
(4) <i>R</i> <sub>4+5</sub> : arising from <i>R</i> + <i>Sc</i> near base.	Fused with <i>M</i> near base‡.
(5) 3 <i>A</i> : straight and close to 2 <i>A</i> .	Curved and distant from 2 <i>A</i> .
(6) anal lobe: not clearly separated from pre-anal portion of wing.	Clearly separated from pre-anal portion of wing.

The characters enumerated for *Tettigarcta* are, without exception, the more primitive. The higher specialization in the Cicadinae is connected with three important

\* Stated to be, and figured as, fused by Myers (1928, p. 390, fig. 53) for *Tettigarcta crinita*. They are separate in the drawing supplied to me by Mr. W. E. China (fig. 3), who writes that the only explanation he can give for this is that Myers did not perceive the distinct though thin vein along the upper margin of the base of the wing, which is the *C* of Evans.

† The Comstock-Needham nomenclature is followed here in order to avoid confusion. It is probably incorrect. A discussion of the identity of the veins of the fore margin of the tegmen is found in Myers (1928). In the hind wing of *Tettigarcta tomentosa*, "*Sc*" beyond the wing-catch seems to be continuous with "*C*" on the proximal side. This was pointed out to me by Mr. W. E. China, who also most kindly supplied fig. 5.

‡ This applies to the majority of the Cicadinae, but some have *R*<sub>4+5</sub> separate from *M*, as in the Tettigarctinae. Mr. China kindly examined for me the genus *Tibicen* Latr. (*Tibicina* Kol.) in which *R*<sub>4+5</sub> and *M* are separate according to Martynov (1931). He writes: "I found that the type, *T. hamatodes* Scop. and the other European species *T. nigronervosa* Fieb., *T. tomentosa* Oliv., and *T. quadronigata* Hagen in our collection all have *Rs* separate from *M*, although the two veins approach rather closely in some species. *Rs* branches off from *R* near the base as in *Tettigarcta*. On the other hand, the North American species *T. septemdecim* L. and *T. cassinii* Fish have the *Rs*+*M* with a common stem at the base. In the closely allied North American genus *Okanagana* Dist., *Rs* and *M* are widely separated at the base, much more so than in *Tibicen*, type *hamatodes*."

structural improvements of the hind wing. The characters (1), (2) and (3) reinforce the fore margin and improve the distribution of the pull exerted by the wing-catch over the anterior portion of the apex. Character (4) is connected with the deep, V-shaped fold which, in the Cicadinae, runs along  $M$  and the lateral edges of which are strengthened by  $R_{4+5}$  and  $Cu\ 1^*$ . The

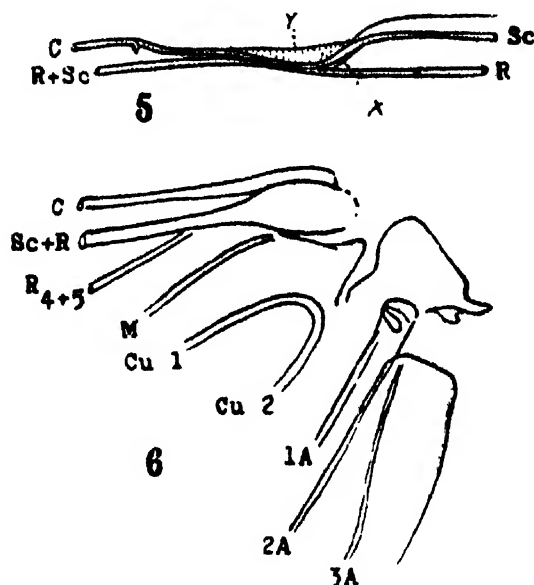


Fig. 5.—*Tettigarcta tomentosa* White. Wing-catch (Y), bordered by a vein which is commonly regarded as  $C$  basally, and as  $Sc$  apically. A branch of  $R+Sc$  (X) connects with " $Sc$ " distally of the wing-catch. See second footnote (†) on p. 113. W. E. China del.

Fig. 6.—*Tettigarcta tomentosa* White. Base of hind wing from underneath. W. E. China del.

fusion of the roots of  $R_{4+5}$ ,  $M$ , and  $Cu\ 1$  gives stability to this fold. In *Tettigarcta*, on the other hand, the bases of these three veins are not concentrated enough ( $R_{4+5}$  coming from the  $R$  stem, not being fused with  $M$ ) to make such a fold a rigid system (fig. 6). The mechanical significance of the fold is unknown.

\* Mr. China examined *Tettigarcta* for me and writes: "The distinct V-fold found along  $M$  in the Cicadinae is not found in the two species of *Tettigarcta* but is replaced by a less distinct fold along the middle of the median cell, i. e. half-way between  $M$  and  $Cu_1$ , the fold continuing past the apex of the cell along  $M_{3+4}$ . As we have only three specimens of *Tettigarcta* it is impossible to say whether this fold is constant or merely accidental in our three specimens."

Characters (5) and (6) are specializations of the anal area. The anal area is folded under, along and immediately behind 2A. This anal lobe is very clearly set off from the remainder of the wing in all Cicadinæ, but not so in *Tettigarcta*. Vein 3A is straight and thin in *Tettigarcta*, but thickened and curved in the Cicadinæ. In the latter, the membrane behind 3A tends to be thick and opaque, and this part of the wing, including 3A, forms a concave depression when fully opened. In the position of rest, however, this area is pressed against the auditory organ, covering it tightly, no matter whether this organ is provided with a lid, or not. Since auditory organs are entirely absent in *Tettigarcta*, the described modification of 3A appears to be correlated with the presence of an auditory organ.

This short comparison of the hind wing of *Tettigarcta* with that of the Cicadinæ shows that, in every respect, this genus is more primitive than the Cicadinæ. The same is known to apply to the tegmen and the body. Many of these primitive characters are discussed by Evans (1941). This author is inclined to assume that at some early phylogenetic stage, the ancestors of *Tettigarcta* possessed rudimentary auditory tympana. Though this assumption cannot be disproved and is, in fact, quite conceivable, the undifferentiated condition of 3A of the hind wing renders it more likely that *Tettigarcta* never had external auditory organs.

*The affinity of the fossil to Tettigarcta.*—The following characters separate the fossil from the Cicadinæ: (1) *C* and *Sc+R* separate between base and wing-catch, (2) *Sc* and  $R_{2+3}$  separate beyond wing-catch. (3) Radial cross-vein ascending from  $R_{4+5}$ . (4)  $R_{4+5}$  branching off from *Sc+R* stem.

These are four out of six characters enumerated above for *Tettigarcta*. The two remaining ones cannot be observed in the fossil as the anal lobe was folded over and is not visible.

It is not, however, generically identical with *Tettigarcta*. The two Recent Australian species have several features in common in which they differ from the fossil. These are: (1) the root of  $R_{4+5}$  is considerably more removed from the wing-base than it is in *Tettigarcta*. (2) The indentation of the fore-margin containing the wing-catch

is much longer in the fossil. (3) The cross-vein connecting *Cu* 1 with  $M_{3+4}$  is short and upright in the fossil, whilst in *Tettigarcta* it is long and almost in the continuation of *Cu* 1. (4) The wing of the fossil is relatively broader, and (5) the dark markings of the fossil wing are absent in the two Recent species of *Tettigarcta*. Whilst the last two differences may not be of greater value than specific, the first three are venational ones and as such sufficiently important to justify the erection of a new genus, *Eotettigarcta*, n. g., with the sole species, *E. scotica*, sp. n.

*Conclusion.*—*Eotettigarcta scotica*, n. g., n. sp., is another instance for modern Australian groups having occurred on the northern hemisphere in the past. Others are, among insects, the Tympanophorinæ (Saltatoria Ensifera, Recent Australia to Malay Peninsula; Oligocene amber of East Prussia), among fishes the Ceratodontidæ (Recent *Neoceratodus* in Australia, Triassic *Ceratodus* in Europe and other continents), among reptiles the Sphenodontidæ (Recent *Sphenodon* in New Zealand, Triassic and Jurassic in Europe and North America). These instances suggest that certain groups of a once wider distribution had a chance of surviving in the Australian region. Most of these groups are primitive; they were replaced by more specialized descendants on the larger continents but preserved their characters in the Australian region which, apparently, had become isolated by the time when the more specialized forms appeared. It is important to collect more data of this kind, since they may enable us eventually to determine the time when Australia became isolated.

My grateful thanks are due to Mr. W. E. China, who helped greatly by studying and describing to me Recent specimens from the British Museum collection which have been evacuated to the country for the time being. He also furnished the figures of Recent forms included in this paper.

## B.

### Family Cercopidæ.

#### *Eocercopidium*, n. n.

1941. *Eocercopsis* Zeuner, Ann. Mag. nat. Hist. (11) vii. p. 88.

*Genotype.*—*Eocercopsis maculata* Zeuner, 1941, p. 88.

*Remarks*.—The name is required because *Eocercopis* is pre-occupied by Handlirsch, 1939, p. 142, who used *Eocercopis* for a genus of the family Procercopidae from the Lias of Dobbertin.

C.

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XI.—*New Species of African Cryptocephalus* (Chrysomelidae, Cryptocephalinae, Col.). By G. E. BRYANT, F.R.E.S., Imperial Institute of Entomology.

ALL the types of the new species are in the British Museum (Nat. Hist).

*Cryptocephalus sheppardi*, sp. n. (Fig. 1.)

Flavous, the head fulvous, prothorax with two triangular black patches on the basal margin, with a rufous patch at the posterior angles. Elytra flavous, with the basal portion narrowly black, and a transverse black band just behind the middle.

Length 3.5 mm.

Head fulvous, feebly and not closely punctured, a longitudinal impression between the eyes. Antennae extending slightly beyond the shoulders, flavous, with the basal and apical segments fuscous, the second segment the shortest, the seven terminal segments more pubescent. Prothorax transverse, widest at the base, the sides rounded and contracted in front, nitid and impunctate,

flavous, with two black triangular patches on the basal margin each side of the scutellum, and a rufous patch between the outer side of the black patch and the side margins. Elytra flavous, with the base narrowly black, the black portion expanding at the shoulders, a transverse

Figs. 1-9



1. *C. sheppardi*, sp. n.
2. *C. nigroornatus*, sp. n.
3. *C. melanospilus*, sp. n.
4. *C. varians*, sp. n.
5. *C. centrolineatus*, sp. n.

6. *C. mandibularis*, sp. n.
7. *C. dissimilis*, sp. n.
8. *C. bevisi*, sp. n.
9. *C. flavocarius*, sp. n.

black band just behind the middle, its lower margin incurved, finely punctate-striate. Legs and underside flavous.

Beira : ii. 1908 (*P. A. Sheppard*), 3 specimens.

Allied to *C. angustofasciatus* Jac., from Natal, but differs in the colour of the prothorax and the position of the apical band on the elytra.

*Cryptocephalus nigroornatus*, sp. n. (Fig. 2.)

Flavous, with the basal half of the head and six terminal segments of the antennæ black, prothorax with two longitudinal black lines not extending to the anterior margin, the basal margin narrowly black, elytra with the base narrowly black, and a transverse black band near the apex.

Length 5–6 mm.

♂♀.—Head with the basal half black, the front flavous, the basal half feebly punctured. Antennæ extending slightly beyond the base of the elytra, longer in the ♂, the five basal segments flavous, the remainder black. Prothorax transverse, widest at the base, the sides rounded and contracted in front, flavous, with the posterior margin narrowly black, two longitudinal black lines not extending to the anterior margin, with the inner margin incurved. Scutellum black, impunctate, oblong, the apex slightly rounded. Elytra flavous, the base narrowly black, the shoulders black, the suture narrowly black, a transverse black band, the upper margin irregular, the apical margin straight, placed between the middle and apex, strongly punctate-striate, the pygidium strongly punctured. Legs flavous, underside flavous. ♀ larger and broader.

N.W. Rhodesia : Mumbwa, 17. ix. 1913 (*H. C. Dollman*), 12 specimens.

N.W. Rhodesia : Kashita, 4. ii. 1913 (*H. C. Dollman*), 2 specimens.

Somewhat allied to *C. angustofasciatus* Jac., but differs in its paler colour, pattern on prothorax, the black suture, and larger size.

*Cryptocephalus melanospilus*, sp. n. (Fig. 3.)

Flavous, the head slightly darker, prothorax with a large black median rounded spot, elytra flavous, with the basal portion narrowly black, and a transverse black band near the apex.

Length 2.5–3 mm.

♂♀.—Head fulvous, rugosely punctured near the eyes, the punctures on the vertex more scattered. Antennæ flavous, short, extending to the base of the prothorax, the basal segment the longest and more dilated, the second to the fifth more slender, the remainder broader and subtriangular. Prothorax transverse, widest at the base, the sides rounded and contracted in front, very finely punctured, flavous, with a large rounded median black spot, extending from behind the anterior margin to a little beyond the centre, the space behind the spot and the basal margin tinged with rufous. Scutellum black, impunctate, triangular. Elytra with the sides almost straight, slightly tapering to the apex, strongly punctate-striate, flavous, with the basal portion narrowly black, the black portion gradually broadening from the scutellum to the shoulder, a transverse black band near the apex, slightly curved, not extending to the side margins. Legs flavous, with the claws black. Underside flavous.

The ♂ is slightly smaller and narrower, and the antennæ are slightly longer. The specimens from Natal and Zululand have the black apical transverse band on the elytra slightly broader and extending nearer the margins.

N.W. Rhodesia: Masengwa, 19. iii. 1913 (*H. C. Dollman*), 3 specimens.

Natal: Durban, v. 1897 (*Sir G. A. K. Marshall*), 1 specimen.

Natal: Verulam, vii. 1897 (*Sir G. A. K. Marshall*), 1 specimen.

Zululand: Eshowe, vii. 1926 (*R. E. Turner*), 4 specimens.

A very distinct species on account of the large round spot on the prothorax. Allied to *C. comædus* Suff., but very much smaller.

*Cryptocephalus varians*, sp. n. (Fig. 4.)

Below flavous, head flavous, prothorax flavous, with two black basal markings varying in size to small spots, elytra fulvous, with the base black, varying in extent almost to the apex.

Length 5.5 mm.

Head flavous, a few fine punctures near the eyes, a short median longitudinal impression at the base. Antennæ flavous, long and slender extending to the



middle of the elytra, the basal segment dilated at the apex, longer than the second and third together, the fourth slightly longer than the third, the remainder each about equal to the fourth. Prothorax transverse, widest at the base, strongly contracted in front, flavous, with two large black subtriangular patches each side of the scutellum, in some becoming a small rounded spot. Scutellum flavous, impunctate, nitid, triangular, raised at the apex. Elytra the sides slightly contracted towards the apex, punctate-striate, fulvous, with the base narrowly black, or extending more than half the length of the elytra. Legs flavous, the tibiae with fine golden pubescence. Underside flavous, the first ventral segment of the abdomen the longest, female with the apical ventral segment with a large rounded fovea.

Kenya Colony: Nairobi, iv. 1927 (*A. F. J. Gedye*), 1 specimen; Kenya Colony: Ol Donyo Sabuk, xi. 1934 (*A. F. J. Gedye*), 1 specimen; Kenya Colony: Nairobi, v. 1921 (*Dr. van Someren*), 1 specimen; Kenya Colony: Kabete, iii. 1922 (*H. E. Box*), 3 specimens; Kenya Colony: Makuyu, 1. vi. 1937 (*C. D. Knight*), 1 specimen, Nyasaland: Zomba (*H. S. Stannus*), 1 specimen.

In structure somewhat allied to *C. gowdeyi* Bry., but differs in size and pattern.

*Cryptocephalus centrolineatus*, sp. n. (Fig. 5.)

Flavous, the head fulvous, the prothorax fulvous, with a median longitudinal flavous line with a black spot on each side at the base, the elytra flavous, with the base and apex black.

Length 5 mm.

♂♀.—Head fulvous, impunctate, the antennae pale flavous, slightly longer in the ♂, the first and second segments more dilated, the second about half as long as the first, the third to the fifth more slender and about equal to each other, the remainder subtriangular. Prothorax widest at the base, the sides rounded and contracted in front, fulvous, with a median longitudinal pale flavous line extending from the base to the apex, a black spot at the base on either side of the line, impunctate, nitid. Scutellum flavous, subtriangular, impunctate. Elytra with the sides almost parallel, rounded at the apex, flavous, with the base narrowly black, the apex black,

strongly punctate-striate. Legs flavous. Underside flavous.

N.W. Rhodesia : Lukanga, ix. 1915 (*H. C. Dollman*), 2 specimens.

N.W. Rhodesia : Mutema, viii. 1913 (*H. C. Dollman*), 1 specimen.

Somewhat allied to *C. gowdeyi* Bry., but differs in its smaller size, the pattern on the prothorax, and the position of the apical black portion of the elytra.

*Cryptocephalus mandibularis*, sp. n. (Fig. 6.)

Pale flavous, the head rufous, with a black basal spot, prothorax with the central portion rufous, with two black maculæ before the middle, elytra with a black transverse band at the base and before the apex.

Length 3-3.5 mm.

♂, ♀.—Head rufous, a black spot at the base, the labrum pale flavous, finely punctured, a short median longitudinal impression between the eyes. Male with the mandibles with a strong projecting horn at the base. Antennæ short, extending slightly beyond the base of the prothorax, the four apical segments slightly fuscous. Prothorax transverse, rufous, the anterior margin narrowly pale flavous, the side margins with the flavous portion widest in front, gradually narrowing at the base, two black median maculæ almost touching, placed just in front of the middle. Elytra pale flavous, a narrow black transverse band at the base, and another curved band before the apex, finely punctate-striate. Legs and underside flavous. Female differs in its slightly larger size, the antennæ shorter and entirely flavous, and the mandibles without the horn.

Rhodesia : Bulawayo, xii. 1903, ii. 1906 (*Sir G. A. K. Marshall*), 2 ♂♂, 1 ♀.

Allied to *C. melanospilus* Bry., but differs in the colour of the prothorax and in having a double spot, and the curious form of the mandibles in the male.

*Cryptocephalus dissimilis*, sp. n. (Fig. 7.)

♂.—Black, the head, prothorax, and four basal segments of the antennæ and legs fulvous, the elytra with 14 ivory white spots.

Length 3.5 mm.

♀.—Fulvous, the prothorax with the front and side

margins ivory white, the elytra fulvous, with 14 ivory white spots.

Length 4 mm.

♂.—Head fulvous, rugosely punctured, a triangular black patch at the inner margin of the eyes, which are strongly notched. Antennæ long, extending almost to the middle of the elytra, the four basal segments fulvous, the remainder black. Prothorax very transverse, nitid, fulvous, with the anterior margin narrowly flavous, widest at the base and contracted in front. Elytra black, strongly punctate-striate, seven ivory-white spots on each elytron, two at the base, two near the middle, one at the apex near the suture, and two narrow ones on the side margins not visible from directly above. Legs fulvous. Underside black, rugosely punctured, the first ventral segment of the abdomen the longest, the second to the fourth strongly contracted in the middle, clothed with short silver pubescence.

♀.—Entirely fulvous, with the front and side margins of the prothorax ivory white. Elytra fulvous, with 14 ivory-white spots, in the same position as the male.

Cape Province: Mossel Bay, ix. 1921, viii. 1930 (*R. H. Turner*), 2 ♂♂, 3 ♀♀.

This is a very conspicuous species on account of the 14 small spots, and the difference of colour in the sexes.

*Cryptocephalus bevinsi*, sp. n. (Fig. 8.)

Reddish chestnut, the head with two flavous spots at the base, prothorax with the front and side margins narrowly ivory white, elytra with the basal margin narrowly ivory white, extending at the shoulder and suture, an ivory-white line between the third and fourth striae extending from before the middle to the apex, and the apical half of the side margins ivory white.

Length 3-3.2 mm.

♂, ♀.—Head reddish chestnut, with two flavous spots at the base, the labrum black, the vertex rugosely but not deeply punctured. Antennæ black, with the basal segment fulvous, extending slightly beyond the base of the elytra, the first segment the longest and more dilated, the second short and rounded, the third to the sixth elongate and more slender, the seventh to the eleventh all about equal and more thickened than the sixth. Prothorax transverse, with the sides slightly rounded,

very nitid, reddish chestnut, with the anterior and side margins narrowly ivory white, the basal margin very narrowly fuscous. Scutellum reddish chestnut, triangular, with the apex slightly rounded and raised, impunctate. Elytra punctate-striate, the sides almost straight, slightly tapering to the apex, reddish chestnut, with the base narrowly ivory white, extending a short way down the suture and at the shoulder, a pale ivory-white line between the third and fourth striæ, extending from before the middle to the apex, the apical half of the side margins narrowly ivory white. Legs flavous, with the tarsi tinged with fuscous. Underside reddish chestnut, rugosely punctured. Male slightly smaller than female, and the antennæ longer.

Cape of Good Hope Table Mt., 1906 (*W. Berins*), 19 specimens.

Cape of Good Hope: Swellendam, ii. 1932 (*R. E. Turner*), 2 specimens.

This unusually coloured species is allied in colour to the female of *C. dissimilis* Bry.

*Cryptocephalus flavovarius*, sp. n. (Fig. 9.).

Reddish chestnut, the head with the inner margin near the eyes flavous, prothorax with the front and side margins narrowly ivory white, and two ivory-white patches in front of the scutellum, the elytra with a complicated ivory-white pattern.

Length 3.3-3.5 mm.

♂, ♀.— Head reddish chestnut, with the inner margin near the eyes flavous, rugosely punctured, with a median longitudinal impression between the eyes, the labrum black. Antennæ extending slightly beyond the base of the elytra, the four basal segments fulvous, the remainder fuscous. Prothorax transverse, reddish chestnut, with the front and side margins narrowly ivory white, closely and finely punctured, two slanting ivory white patches in the middle of the basal margin. Scutellum reddish chestnut, triangular, nitid. Elytra with the sides almost straight, slightly tapering to the apex, punctate-striate, the punctures fine and close, reddish chestnut, with a very complicated ivory-white pattern, four ivory patches at the basal margin, the sides and apex broadly ivory white, the apical portion running up parallel with the suture to the middle of the elytra into an irregular point.

Legs flavous. Underside flavous, with a few scattered punctures, the first ventral segment of the abdomen the longest, the second to the fourth short and contracted in the middle. Female with a large oblong fovea on the apical segment.

Cape of Good Hope : Table Mt., 1906 (W. Bevins), 13 specimens.

Cape of Good Hope : Milnerton, 14 28. xii. 1925 (R. E. Turner), 12 specimens.

Allied in colour to *C. bevinsi* Bry., but differs in pattern.

XII.—*The Wild Cat (Felis lybica) of Palestine.* By R. I. Pocock, F.R.S. (Zoological Dept., Natural History Museum).

THE Wild Cat (*Felis lybica*), which is common all over Africa outside the forest area of the Congo and has become differentiated into a number of local races, spreads into south western Asia, where it is represented by a few subspecies, of which the best known are *F. l. ornata* of North Western India and *F. l. caudata* of Turkestan. These two are commonly regarded as representing a species distinct from *lybica*; but in 1939 I gave reasons for considering them to be subspecies of that typically African species (Mamm. Brit. India, vol. i. pp. 289 290)\*. The cat from Palestine and Arabia, here given a new name, more closely resembles the North African races than it resembles those from India and Turkestan. It was described long ago by Canon Tristram, but the name he applied to it is inadmissible.

*Felis lybica tristrami*, subsp. nov.

*Felis syriaca* H. B. Tristram, 'The Natural History of the Bible,' p. 67, 1867 †. Not *Felis domestica syriaca* Fischer (ex Aldrovandi), Syn. Mamm. p. 207, 1829.

*Felis constantina syriaca* Morrison-Scott, Novit. Zool. xli. p. 197, 1939 (not of Fischer).

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\* In this volume I made the mistake of taking *constantina* as the specific name of this cat. It now appears to me that *constantina* almost certainly was given by Forster in 1780 to the Algerian Serval, and not to the African Wild Cat as Cabrera decided in 1932.

† After commenting on the rather Lynx-like appearance, short tail, tufted ears and large size of *Felis chaus*, Tristram described the cat now under notice as "another wild, long-tailed species, the Syrian Cat (*Felis syriaca*), which more nearly resembles the wild cat of Europe."

*Locality of the type.*—Ghor Seisaban, Moab.

*Distribution.*—Palestine and Western Arabia.

Distinguished from the Egyptian Wild Cat (*Felis lybica lybica*=*maniculata*) by its darker, greyer, less sandy general hue, darker ears on the average, by a tendency for the pattern above to be more spotty and by the less extensive blackness on the hind foot.

The series of skins is on the whole tolerably uniform, the colour of the upper side varying from pale slightly tawny grey to duller or brighter ashy grey, and on the underside from whitish to rich buff, almost ochreous; the face is well pigmented and the ears vary from rusty brown to darker greyish brown, darkening at the tips; the pattern on the upper side is always faint, sometimes hardly visible, and shows a tendency to break up into spots; it is never strong below, is typically weak on the outer sides of the limbs and the black on the upper part of the back of the hind foot is less deep and less extensive.

The type, an adult ♀, from Ghor Seisaban, Moab (H. B. Tristram, 93.1.29.3), March 12th, has the coat very soft, full and long, 44 mm. on the flanks, 47 on the crest, the difference between them being very slight. The general colour above is pale buffy white, darkened with fuscous speckling, the spinal area being deeper buff with black speckling; the wool on the flanks is rich buff, exposed to a certain extent by the thinning contour-hairs, on the crest rich ochreous from the nape backwards; the ears are palish rusty brown, darkening at the tip, which is pencilled; the speckling of the crown spreads between the whitish patches bordering the eyes internally, the top of the muzzle is rusty, the cheeks buffy white with two red stripes, and the upper lip and chin are white; the legs externally are like the flanks, with the paws deeper buff. The pattern is obsolete on the head, nape and shoulders, faint on the flanks, weak and brown on the outer side of the legs, being strong and black only on the tail, apart from the bracelet\*. On the underside the throat, which has a fuscous collar, and the chest are superficially white, but buff below, and the white extends all down the middle line, narrow on the belly but spreading over the inner side of the thighs; the spots are red, and

\* The name proposed for the persistent black stripe on the inner side of the fore leg between the wrist and elbow. There is sometimes an additional one above.

there is some ochreous round the genitalia and on the backs of the thighs, whence it extends, gradually fading, to the hocks; the hind foot is only black distally behind, being greyish brown in the upper half.

An adult ♀ from Junction Station, Jerusalem (G. C. Shortridge, 18.8.1.8), April, has the coat 31 and 45 mm., thinner and a little shorter than in the type, but is like it in colour above, although ochreous below, the hairs being much less extensively whitened, with the stripes on the legs stronger: the hind foot is not "booted" in its upper part.

An unsexed skin labelled Palestine (M. Portal) has the coat 39 and 40 mm., concealing the wool, but otherwise the colour of the contour-hairs and of the wool is nearly the same as in the type, although the pattern is a little stronger; the ears are rubbed but were apparently as in the type. A female skin with the same history, has the coat 33 and 48 mm. and differs from the preceding in being more ashy grey above, the pattern everywhere more distinct and apparent on the nape and shoulders, the ears dark greyish brown with no rusty tint, the underside less white, more buffy, and the spots blacker. A female from Ramleh, 10 miles from Jaffa (M. Portal, 19.4.11.1), Nov., has the coat 30 and 42 mm., the ears dark as in the last, but differs in being decidedly more silvery grey above, less buffy below, with the pattern on the legs and abdomen still blacker, and the hind foot blacker towards the hock. Another female with the same history (19.4.11.2), Dec. 20th, has the coat 30 and 43 mm. and is more ashy grey above than the type, but a little darker and much less silvery than the other from Ramleh, and further differs from the latter in having less black on the spinal area, with the pattern less pronounced above and below, the underside less buffy, and the hind foot not so black in its upper part. A young skin from near Jaffa in the Tring Museum (Sladen, 1667), June, has the coat 21 and 35 mm., and is hardly distinguishable from the type in superficial colour, including the ears, but differs in its much shorter coat and very pale wool, both seasonal features, and its more distinct pattern due to its short coat and immaturity.

The following three Arabian specimens are assigned to the same race:—An adult male from Irak Well, Wadi Thar (17° 40' N., 44° E.), 4300 ft. (H. St. J. Philby, 40.175),

Nov. 6th, with the coat 36 and 42 mm., matches the skin from Ramleh (19.4.11.2) in superficial colouring except that the ears are paler as in the type, and the wool is duller in tint, almost as in the skin from near Jaffa (Sladen). A female skin from 15 miles north of Jidda on the Red Sea coast (A. G. Griffen, 40.176), Jan., with the coat 31 and 35, very closely resembles the first described skin collected by Portal, and its ears are as in the type. It may be noted that the pattern is greatly broken up into spots and that the black on the hind foot is restricted to its lower part. A young female from north east of Jidda (Philby, 40.177) differs from the preceding in being uniformly ashy grey all over, and the pattern above is practically obsolete, although present on the legs and below.

Only two of the skins were measured in the flesh, as follows:—

	Head and body.	Tail.	Hind foot.	Ear.
Wady Thar, Arabia, ad ♂	20	15½	5½	2½
Near Jerusalem, yg ad. ♀	21½	13½	5	2½

The given dimensions of the head and body and the tail of these two specimens suggest a difference in the method of measuring those two areas. It is unlikely that Philby's Arabian specimen, an adult ♂, with a condylobasal length of 90 mm., had a shorter head and body than Shortridge's Jerusalem specimen, a young adult ♀ with a condylobasal length of 87 mm.; and it may be noted that the total length from nose-tip to tail-tip in Philby's is slightly longer than in Shortridge's specimen. The relative dimensions of the latter are more normal, although large for a ♀, its skull being 7 mm. longer than that of the type.

The skulls, which are about the same size as those of most of the North African races, show no distinctive features, but the teeth vary individually in dimensions, as noticed by Morrison-Scott in the two female skulls from the north-east of Jidda, the two carnassials in the younger (40.177) being 12 and 9 mm. respectively, whereas in the older (40.176) they are 10½ and 8 mm. Morrison-



Scott suggested that the smaller teeth might be due to the cat being of impure breed, with a domestic strain, but its teeth are about the same size as those of the specimens from Ramleh and Jerusalem, and the upper carnassial is only a trifle smaller than that of the type, which is 11 mm., as in Philby's adult male from Wadi Thar. The tooth in the young female is exceptionally large.

Two additional Arabian Cats in the British Museum were referred by Morrison-Scott to this race. One, an adult ♂ (95.6.1.61) trapped in the bazaar in Aden by Colonel Yerbury, Feb. 18th, was regarded by him as a domestic cat and was quoted as *Felis maniculata* by Thomas (Proc. Zool. Soc., 1895, p. 507). Yerbury's opinion was, I think, correct. The coat, although at its best according to the date, is harsh, thin, with very little wool, and short, the hairs of the flanks being about 20 and of the crest 30 mm., very different from the soft full coat of the specimens described above, the general colour is greyish brown and the pattern of a deeper brown shade is fairly well defined, the black of the spinal area breaking up into longitudinal stripes, the black of the hind foot is restricted to its lower part. The skull, with a condylobasal length of 89 mm., is about as long as in Philby's adult ♂ from Wadi Thar, but the bullæ are smaller, only 19 mm. long as compared with 22 mm., and the carnassials are also smaller, the upper being 10 and the lower  $7\frac{1}{2}$  mm. long, whereas in Philby's they are 11 and 9 respectively. The bullæ and teeth are typically smaller in domestic cats, feral or tame, than in related wild races.

The other specimen (99.11.6.33), shot in desert scrub by Perival and Dodson at Lahej, near Aden, August 27th, was regarded as a genuine wild cat and identified by Thomas as *F. maniculata* (Proc. Zool. Soc. 1900, p. 100). But since it has a coat similar to the last, although even thinner in accordance with the date, I regard it as a feral tame cat. It differs from the Aden specimen in colour, being pale sandy grey with fainter pattern, suggesting faded summer coat. Since, however, its bullæ and teeth are as large as in Shortridge's Jerusalem specimen, it may be a half-bred specimen.

This Asiatic race of *F. lybica* is interesting from two other points of view. In 1906 (Proc. Zool. Soc. 1905,

p. 317) Bate described as *Felis ocreata agrius* two skins of cats bought in the Bazaar at Kanea in Crete. The type (5.12.2.15) of this supposed race is a domestic cat with the *torquata*-style of pattern, as I stated in 1911, and is an exact match, as nearly as can be, of a feral house-cat from Tunis in the British Museum, and closely resembles others from various parts of the world. The type of course carries the name *agrus*, which thus falls as a synonym of *torquata*. But the topotype (5.12.2.14) in coat and general colour closely resembles the type of *F. l. tristrami* from Moab, has the same pattern as the skin from Jerusalem, except that it is stronger on the nape and shoulders, and the dark ears of the skin from Ramleh. Its hind feet also have the black restricted to the lower portion. If this specimen represents, as is possible, an indigenous Cretan race, its close likeness to the Syrian race is interesting.

In the second place, the tendency in *F. l. tristrami* for the pattern on the flanks to be more spotty, for the disappearance of the black on the back of the metatarsi, and for the lesser differentiation of the spinal crest, are all features leading towards the two more eastern races *ornata* and *caudata*, which in 1939 I assigned to the same species as the African Wild Cat.

[Major Maurice Portal tell me (*in litt.*) that the cats he shot at Ramleh inhabited country characterized by abundance of rocky outcrops and tolerably thick scrub consisting of juniper and holm oak or ilex. They sheltered under large detached rocks found here and there.—R. I. P.]

XIII.—*The Wild Cat (Felis lybica) of Northern Benguela, Angola.* By R. I. Pocock, F.R.S. (Zoological Dept., Natural History Museum).

ON their ethnological expedition to Angola in 1936, Miss D. and Miss A. Powell Cotton procured from natives in Northern Benguela a series of ten adult skins and one kitten of the Wild Cat (*F. lybica*). Two of the adults (Nos. 41 and 58) they generously presented to the British Museum in the following year and the remainder, stored in the Powell Cotton Museum, Quex Park, they recently

and kindly lent to me for examination. These skins appear to represent an undescribed race which may be named and described as follows :-

*Felis lybica pyrrhus*, subsp. nov.

*Locality of the Type* :—Sogera, an Umbundu village on the road from Bokoio to Luimbale, Benguella.

Resembling and intergrading with *F. l. mellandi* Schwann (Ann. & Mag. Nat. Hist. (7) xiii. p. 423, 1904), of which the typical locality is Mpika, North-Eastern Rhodesia, but distinguished on the average by the richer hue of the underside, by the greater distinctness of the pattern above, and by the flanks being more tinged with buff and less uniformly dark grey.

The type (No. 37.5.12.9 and 41) has the general colour above greyish brown, with the spinal area blackish, but not very sharply defined laterally, and a good deal of brightish buff on the side behind the shoulder, spreading upwards from the chest, the wool on the flanks is rich buff at the summit, but on the crest it is mostly sooty grey, only slightly tinged with buff on the loins. The crown of the head is noticeably darker than the nape and the backs of the ears are deep rusty brown; there is no white on the face, the patches between the eyes being buff, the summit of the muzzle rusty brown and the upper lip and lower cheek rich buff; the chin and interramal area are buff and defined behind by a reddish collar continuous with the lower genal stripe, the rest of the underside is rich ochreous red; the pattern of the upper side consists of fairly well defined grey-brown stripes becoming stronger on the thighs; the spots below are rusty or rusty brown, and there is a deep red-brown collar on the hind throat; the fore leg is mostly rich golden ochreous down the front, with a good deal of black behind and strong black stripes; the hind legs are defective.

A second skin (No. 37.5.12.10 and 58) from Umbulu or Evavaela, a village, also in the Umbundu district, on the Luimbale-Balundu road, differs from the type in being greyer, not so brown above and less richly coloured below, but the pattern is nearly as well defined. Another (59) from the same spot closely resembles (58), except that the pattern is very faint. A topotype (5) closely matches (59), and differs therefore from the type in being greyer

above, paler below, and in the faintness of the pattern. A skin (17) from Bokoio on the Luimbale Road is nearly as red as the type below, but has the pattern faint and the upper side definitely darkish grey, pepper and salt. Another (31) from the same place has similar grey hue above, is paler below but has the pattern nearly as strong as in (58); a third (25) from the same place is deep red below, with the pattern above very faint as in (17). A skin from Kangombo (164) has the dark pepper and salt grey hue above and the pattern of (31), and of two of a set from Cambango, one (149) closely matches (17) in its deep red hue below, pepper and salt grey hue above and indistinct pattern, whereas another (150) closely matches (50) in its very distinct pattern, which is, however, more spotty, and in colour has the patches between the eyes, the cheeks and chin white.

The skin of the kitten, from the same locality as the type, has a head and body measurement of 12 inches, and is therefore about half-grown. The ground-colour of the upper side is pale ochreous, with a sprinkling of white tipped hairs and fading to buff below, the crown of the head being brown, the ears are rusty brown with darker tips; the pattern is blackish brown and strongly pronounced, nearly concealing the ground colour of the upper side from the shoulders backwards; there is some white on the chin and throat but none elsewhere.

A youngish native skin from Mt. Moko, Luimbale (Dr. K. Jordan, 35.1.6.72) is not so rich-tinted below as the foregoing adult skins and has no appreciable pattern. It connects this new race with *F. lybica mellandi*. Schwann's description of the latter is most misleading. He described the upper side as greyish buff, darker in the middle line, the lower surface as creamy buff, the nose and ears bright yellowish and the cheeks yellow, almost white. To my eyes the upper side of the type is dark grey, owing to the black and white speckling of the contour-hairs; the blackened spinal area has dull buff speckling; the lower side is ochreous buff diluted by the long whitish tips to the hairs; the ears and nose are mainly rusty ochreous and the cheeks are buff, contrasted with the white chin. Also in his synoptical table of the African races of this cat Schwann states that the fore legs of *mellandi* are inconspicuously ringed. They are, on the contrary, distinctly and normally striped.

The more southern Angolan race, described by Thomas as *F. ocreata griselda*, from 50 miles south of Dombe Grande, Benguella (Ann. & Mag. Nat. Hist. (9) xvii. p. 180, 1926), is of the semi-desert type inseparable from the cats of this species found in Damaraland and the adjoining districts. It is whitish above and below and differs strikingly in colour from the new form here described.

XIV.—On *Apion russeolum* Gyll. and *Apion tropicum* Htm.

By J. BALFOUR-BROWNE, M.A., F.Z.S., F.R.E.S.

*APION TROPICUM* Htm. was described from Tanganyika: Kwai and Usambara. In the Coleopt. Cat., Pars 6, the name is given in synonymy with *russeolum* Gyll., but this appears to be the only statement of this synonymy, since the only references given for each name are those of the original descriptions. Gyllenhal described *russeolum* from "Africa australis" and this is almost certainly from the Cape Province. The synonymy of the two species is rather unlikely on the localities whence they came. The position is further confused by the specimens I have seen identified by Wagner.

Two examples from Cape of Good Hope, Table Mt., (*W. Bevins* coll.) in the British Museum are labelled "*tropicum* Htm. ♀" by Wagner (both specimens are, in fact, indubitably male by the form of the apparent fifth ventrite), and a female in Marshall's collection from Salisbury, Feb. 1906, G. A. K. M. is labelled "*Apion russeolum* Gyll. ex typ.!" also by Wagner, but these two species are not the same. Also in Marshall's collection are one male, three females from S. Rhodesia, Matopo Hills, nr. Bulawayo, x. 1931 (*Miss A. MacKie* coll.) and these are conspecific with the Salisbury specimen above mentioned.

On the strength of Wagner's statement that the Salisbury female was "*exempla typica*" I was preparing to describe the Table Mountain species as new, since it is certainly not *tropicum*, in spite of the inadequacy of Hartmann's description. After discussing the matter with Sir Guy Marshall, however, I am ignoring Wagner's statement and treating the Cape specimens as *russeolum* and the Southern Rhodesian specimens as *tropicum* and whilst this method avoids the projection of yet another

name into the imbroglio it must remain subject to a re-examination of the types of both species for a final confirmation.

Both original descriptions are inadequate for an identification of such similar species, and I have made a full re-description of each species according to the above interpretation and based on the listed material. The two descriptions are followed by a tabular comparison.

*Apion russeolum* Gyll.

*A. russeolum* Gyll. in Schönh. Gen. spec. Curc. v. (i.) 1839, p. 398 (Africa australis).

♂. Derm rufous, the scutellum and claws piceous ; strongly punctured, each puncture bearing a curved semi-erect lanceolate cream-coloured scale ; scales of the legs similar ; elytra strongly and deeply striate ; interstriae convex, shining ; anterior claw of the two anterior pairs of legs distinctly dentate near the apex, posterior claw of these legs and both claws of the posterior legs simple, non dentate ; four posterior tibiae without interno-apical spur.

*Head* nearly twice as wide as long (1.9 : 1.0) ; eyes prominent, strongly rounded ; frons as wide as the base of the rostrum, flat, strongly, almost rugosely, punctured, the punctures separated by about half their diameters, the interstices strongly microreticulate, the punctures vaguely linear and bearing curved, lanceolate, semi-erect cream-coloured scales ; temples linear ; beneath the eyes with a patch of short spatulate pure white scales. *Rostrum* longer than the pronotum but not as long as the head and pronotum together, stout, curved, cylindrical, coarsely and rather closely punctured, the interstices not more than half the diameter of the punctures and distinctly reticulate except at the extreme apex ; the basal punctures dorsally linear, continued from the frons up to the antennal insertion, all punctures bearing a short curved lanceolate scale. *Antennae* inserted at one-third of the length of the rostrum from the base, fairly elongate and slender ; scape long, as long as the first four segments of the funicle taken together ; first and second segments of the funicle subequal in length, the proximal segment twice as wide as the second segment ; third to seventh segments progressively shorter and broader, seventh nearly transverse ; club ovoid, widest at the proximal segment. *Pronotum* distinctly wider than long, widest at

about one-third from the base, the sides quite strongly rounded, the subapical constriction obsolete; base bisinuate; dorsal outline barely convex, almost flat; strongly and rather coarsely punctured, almost rugose, the interstices of the punctation on the disc less than one-quarter the diameter of the punctures, distinctly microreticulate; each puncture bearing a curved, lanceolate, semi-erect cream-coloured scale; without trace of the median dorsal sub-basal fovea. *Scutellum* black, elongate, attenuate to the apex, twice as long as wide, coarsely microreticulate, longitudinally obsoletely sulcate, without basal prominences or upturned apex. *Elytra* ovate, widest just behind the middle; regularly convex; humeral callus rather prominent; at the base vaguely carinate; strongly and deeply striate, catenate punctate, the punctures separated by about their diameters; interstriae convex, strongly so, not wider than the striae, smooth and shining; striae 1 and 2 uniting with 9 at apex; all striae deeply impressed just behind the base, as deeply there as on the disc; interstriae irregularly bilinearly finely punctate, whence rise semi-erect, curved, short lanceolate cream-coloured scales; elytral apices rounded-rectangular. *Venter* coarsely but not closely punctured, sparingly clothed with white scales. *Legs* short and stout, hind femora not nearly attaining the apex of the abdomen; femora with almost adpressed, tibiae with distinctly sub-erect curved whitish lanceolate scales; claws black, anterior claw of the anterior and middle legs with a distinct acute tooth near the apex, the main body of the claw thickened to the base; posterior claw of these legs and both claws of posterior legs simple.

Length 1.90–2.03 mm. (*sine rostro*).

Cape of Good Hope: Table Mountain (W. Bevins coll.), 2 ♂♂.

*Apion tropicum* Htm.

*A. tropicum* Htm. Deutsche ent. Zeits. 1904, p. 392 (Tanganyika: Kwai and Usambara).

♂♀.—Derm rufescent, rostrum basally, scutellum, elytral suture and claws piceous or fuscous, venter infusate; distinctly punctured, each puncture bearing a curved lanceolate semi-erect or almost adpressed white scale; scales of the legs straight, spatulate; elytra strongly striate; interstriae convex, finely rugose, sub-

shining, claws simple; four posterior tibiae of the male without interno-apical spur.

*Head* one and a half times wider than long (1.5 : 1.0); eyes not particularly prominent, weakly rounded; frons slightly narrower than the base of the rostrum, flat, distinctly punctured, the punctures separated by about their diameters, the interstices strongly microreticulate the punctures clearly linear and each bearing an almost adpressed weakly curved lanceolate white scale; temples linear; beneath the eyes a patch of dense spatulate white scales. *Rostrum* barely longer than the pronotum, stout, weakly curved, cylindrical, finely and not densely punctured, the interstices two to three times the diameter of the punctures; distinctly reticulate at the base, obsoletely so apically, the punctures of the base linear, continued from the frons and attaining the antennal insertion, the basal punctures alone bearing a scale. *Antennae* inserted at about one-quarter of the length of the rostrum from the base, fairly elongate and slender; scape long, as long as the first four segments of the funicle taken together; first segment of the funicle twice as wide as the second segment and one and a half times as long; third to seventh segments progressively shorter and broader, seventh segment square; club ovoid, widest at the basal segment. *Pronotum* little wider than long, widest at basal third, the sides not strongly rounded, the sub-apical constriction shallow; base bisinuate; dorsal outline very weakly convex; moderately strongly punctured, the punctures separated by about their diameters, the interstices microreticulate, each puncture bearing a semi-erect lanceolate cream-white scale; without trace of a median dorsal sub-basal fovea. *Scutellum* infusate, twice as long as wide, parallel-sided, apex rounded, longitudinally furrowed, microreticulate. *Elytra* short oval, widest just behind the middle; regularly but not highly convex; humeral callus moderately prominent; at the base fairly distinctly carinate; strongly striate, the striae catenate punctate, the punctures separated by about their diameters, each interspace bearing a very short white scale; interstriae convex, one and a half times wider than the striae, finely rugose, bearing bilinearly a loose pattern of lanceolate almost adpressed weakly curved scales which, where the pattern fails, are replaced by rufescent setae; striae 1 and 2 uniting with 9 at apex; elytral apices rather produced rectangular in both sexes.



*Venter* distinctly but sparsely punctured, sparingly clothed with lanceolate white scales. *Legs* short and stout, hind femora not exceeding the apparent fourth ventrite; clothed with straight spatulate white scales which are almost adpressed; four hind tibiae of the male without an interno-apical spur; claws simple, without trace of a tooth.

Length 1.63-1.87 mm. (*sine rostro*).

South Rhodesia: Salisbury, Feb. 1906 (*G. A. K. M.*), 1 ♀ (*russeolum* Gyll. Wagner det.); Matopo Hills, nr. Bulawayo, x. 1931 (*Miss A. MacKie* coll.), 1 ♂, 3 ♀♀.

*russeolum*.

Rostrum strongly punctured; second and third segments of the antennal funicle subequal; head twice as wide as long, eyes prominent; interspaces of thoracic punctation less than the diameter of the punctures. Elytral striae stronger, equal to the interstriae; interstriae smooth and shining; venter more coarsely punctured; legs clothed with semi-erect, curved scales; anterior claw of anterior and intermediate legs toothed at apex, other claws simple. Size larger.

*tropicum*.

Rostrum finely punctured; second segment of antennal funicle longer than the third; head one and a half times wider than long, eyes not prominent; interspaces of thoracic punctation equal to the diameter of the punctures. Elytral striae weaker, less than the width of the interstriae; interstriae finely rugose, sub-shining; venter more finely punctured; legs clothed with almost adpressed spatulate scales; claws quite simple. Size smaller.

It will be seen from the foregoing descriptions and tabular comparison that the two species are quite distinct and comparatively easily separated, whether or not both are available for a comparison, the differences in sculpture of the rostrum and pronotum, the size of the head, the character of the elytral striae and the presence or absence of toothed claws being absolutely definitive.

XV.—*New Species of African Cryptocephalus* (Chrysomelidae, Cryptocephalinae, Col.). By G. E. BRYANT, F.R.E.S., Imperial Institute of Entomology.

[All the types of the new species are in the British Museum Collection.]

*Cryptocephalus fulvoterminalis*, sp. n. (Fig. 1.)

Below fulvous, above black, except the head, part of the prothorax, scutellum and apex of the elytra fulvous, antennae flavous, with the terminal segment black, legs flavous.

Length 4-5 mm.

♂, ♀.—Head fulvous, feebly and not closely punctured. Antennæ flavous, with the terminal segment black, extending beyond the middle of the elytra, the first segment more dilated and twice as long as the second, the fifth slightly longer than the fourth, and the remainder each about equal to the fifth. Prothorax fulvous, with two triangular black patches, not quite touching the anterior margin, very nitid and impunctate, widest at the base, with the sides contracted in front. Scutellum triangular, fulvous, edged with black, impunctate. Elytra black, with the apex fulvous, finely punctate-striate, and nitid. Legs flavous, the claws with the apex black. Underside fulvous. Male differs in being smaller, the antennæ longer, and the punctures of the elytral striae somewhat closer and stronger.

N.W. RHODESIA : Mwingwa, 27. vii. 1913 (*H. C. Dollman*), 13 specimens.

Allied to the group *C. gladiatorius* Suff., but differs in the thoracic markings and the slender antennæ with the black tip.

*Cryptocephalus multicostatus*, sp. n. (Fig. 2.)

Chestnut brown, the prothorax narrowly margined with flavous, and a median longitudinal flavous line, the entire surface covered with longitudinal wavy grooves, the elytra chestnut brown with the costæ flavous, antennæ black.

Length 4 mm.

♂.—Head chestnut brown, transversely impressed between the antennæ. Antennæ black, very long, extending beyond the middle of the elytra, the first segment twice as long as the second and more dilated, the third about as long as the first but more slender, the remainder each about as long as the third. Prothorax transverse, widest at its base, the sides rounded and contracted in front, chestnut brown, the margins narrowly flavous, a median longitudinal flavous stripe and a faint flavous spot on each side just behind the middle, the whole surface covered with longitudinal wavy grooves. Scutellum fulvous, impunctate. Elytra chestnut brown, with five strong flavous costæ enclosing double rows of very strong punctures. Legs with the femora and basal third of the tibiæ fulvous, the apical two-thirds of the tibiæ and the tarsi black. Underside chestnut brown.

KENYA : Bura, Teita, 5000 ft., ii. 1939 (*Dr. V. G. L. van Someren*).

Figs. 1-9.



1. *C. fulvoterminalis*, sp. n.
2. *C. multicoloratus*, sp. n.
3. *C. apiciflavus*, sp. n.
4. *C. flavomarginatus*, sp. n.
5. *C. cylindriciformis*, sp. n.

6. *C. atrolineatus*, sp. n.
7. *C. nigrozonatus*, sp. n.
8. *C. picticollis*, sp. n.
9. *C. andersoni*, sp. n.

This is a very unusual and striking species on account of the strongly raised costæ of the elytra and the grooves on the prothorax. On account of the strigose prothorax it is related to *C. molirænsis* Clav., and *C. natalensis* Jac.

*Cryptocephalus apiciflavus*, sp. n. (Fig. 3.)

Black, the elytra with the apex broadly flavous, under side with the ventral segments of the abdomen flavous, the elytra strongly punctate striate.

Length 5-6 mm.

♂, ♀.—Head black, the clypeus and a spot near the inner margin of the eyes flavous, the median portion with a few strong punctures. Antennæ black, extending almost to the middle of the elytra, the five basal segments more nitid, the remainder more pubescent, the second segment short and rounded. Prothorax black and nitid, impunctate, transverse, widest at the base, with the sides slightly rounded and contracted in front. Scutellum black, nitid, subquadrate. Elytra black, with the apex broadly flavous, extending about a third up the side margin, very strongly punctate-striate. Legs black, with the underside of the femora flavous. Underside with the sternum mostly black, the ventral segments of the abdomen flavous, clothed with very fine short grey pubescence.

B. E. AFRICA: Ilala, Maramas District, vi. 1911 (*Dr. S. A. Neave*), 5 specimens.

B. E. AFRICA: Nyangori, N. Kavirondo, 4800 ft., v. 1911 (*Dr. S. A. Neave*), 2 specimens.

B. E. AFRICA: Nandi Plateau, 5700-6200 ft., v.-vi. 1911 (*Dr. S. A. Neave*). 4 specimens.

This is a very distinct species, somewhat allied to *C. gladiatorius* Suff., but the prothorax entirely black, the puncturation of the elytra very much stronger, and somewhat flatter and less convex.

*Cryptocephalus flavomarginatus*, sp. n. (Fig. 4.)

Black, with the exception of the head and prothorax fulvous, and the elytra somewhat broadly margined with flavous, and very finely punctate-striate.

Length 4 mm.

♂, ♀.—Head fulvous, the labrum black, impunctate. Antennæ black, not extending to the middle of the elytra, the first segment twice as long as the second, the second rounded, the third and fourth equal, each a little longer

than the second but more slender, the remainder more dilated and more pubescent. Prothorax fulvous, nitid, very finely punctured, transverse, widest at the base, the sides rounded and contracted in front. Scutellum black, impunctate, subquadrate. Elytra black, rather broadly bordered with flavous, very finely punctate-striate, the sides almost parallel, rounded at the apex. Legs entirely black. Underside black, the first ventral segment of the abdomen the longest, about equal to the three following, clothed with very fine short pubescence.

E. CAPE PROVINCE : Katberg, 4000 ft., xii. 1932 (*R. E. Turner*), 2 specimens.

Allied to *C. atrocinctus* Jac., which has longitudinal black bands on a pale ground on the elytra.

*Cryptocephalus cylindriciformis*, sp. n. (Fig. 5.)

Above black, below pale lemon, of oblong cylindrical shape, prothorax nitid, the elytra strongly punctate-striate, the sides irregularly punctured.

Length 6 mm.

♀.—Head black, the labrum and a patch near the inner margin of the eyes fulvous, a longitudinal median impression between the eyes, with a few strong punctures on either side. Antennæ long, extending beyond the middle of the elytra, the apical portion of the three basal segments fulvous, the second segment very short, the fifth to the apical segment clothed with silvery pubescence. Prothorax black, very nitid, with a few fine scattered punctures, the basal angles tinged with fulvous, the sides rounded and narrowly margined. Scutellum black, impunctate, with the apex strongly raised. Elytra black, oblong, the sides parallel and rounded at the apex, strongly punctate-striate, the punctures at the sides irregular and more rugose. Legs black, the femora with the underside lemon colour. Underside pale lemon, the metasternum partly black, the second to the fourth ventral segments of the abdomen strongly contracted in the middle, the apical segment with a very deep oblong fovea.

CAMEROONS : Bebera Bondaye, 6. v. 1914 : 1 ♀.

A very distinct species on account of the strong contrast in colour of the upper and underside, and its cylindrical form. Somewhat allied to *C. apiciflavus* Bryant, as regards colour and puncturation, but a very different

*Cryptocephalus atrolineatus*, sp. n. (Fig. 6.)

Head and antennæ black, prothorax fulvous, with two broad black patches, a few very fine punctures, elytra finely punctate-striate, fulvous, with three longitudinal black bands.

Length 4 mm.

♂, ♀.—Head black, rugosely punctured, the clypeus and the patch in the notch of the eyes pale yellow. Antennæ black, extending to the middle of the elytra, the first segment twice as long as the second, the third and fourth about equal and slightly longer than the second, the fifth to the apical segment all slightly thickened. Prothorax transverse, widest at its base, the sides rounded and contracted in front, fulvous, with two broad black somewhat semicircular longitudinal patches, and a black spot in the middle of the side margins. the surface nitid, but with a few very fine scattered punctures. Scutellum subquadrate, black, nitid. Elytra with the sides almost parallel, rounded at the apex, fulvous, with three black longitudinal bands not extending to the apex, the sutural one slightly broadening from the base, not reaching the apex, the apical half of the side margins very narrowly black, finely punctate-striate. Legs black, the femora with the underside fulvous. Underside with the median portion of the pro- and meso-sternum flavous, the ventral segments of the abdomen black. *Male* differs in having the underside more flavous and the black thoracic markings reduced to a spot, and a deep fovea on the apical ventral segment.

TANGANYIKA: Ndala Mission, xii. 1916 to i. 1917 (Dr. G. D. Hale Carpenter), 4 specimens.

Allied to *C. atrocinctus* Jac., but is more elongate, more nitid, puncturation finer, and the black bands not so broad.

*Cryptocephalus nigrozonatus*, sp. n. (Fig. 7.)

Flavous, head with vertex and basal portion black, prothorax with two black patches, elytra with a black patch near the shoulders, the suture and a transverse band near the apex black.

Length 5 mm.

♂, ♀.—Head rugosely punctured, the vertex and base black, the labrum black, the clypeus and the portion near the inner margins of the eyes flavous. Antennæ extending to the middle of the elytra, fulvous. Prothorax transverse, widest at the base, the sides contracted

in front, impunctate and nitid, flavous, with two black patches separated by a median longitudinal flavous line expanding at the base, and the side margins broadly flavous. Scutellum black, nitid, the apex raised and rounded. Elytra with the sides almost parallel, slightly tapering to the apex, strongly punctate-striate, flavous, with a black patch near each shoulder, the suture broadly black, expanding just before the middle, and a transverse broad irregular black band near the apex. Legs black, with the underside of the femora flavous, the pygidium black, clothed with short grey pubescence. Underside black and flavous, the median portion of the ventral segments of the abdomen black, clothed with grey pubescence.

ANGOLA: Brit. Mus. Coll. 76.28, 2 specimens. "Delivered to the B.M. by the executors of Dr. Wetwitsch as from the King of Portugal in accordance with the Decree of the High Court of Judicature dated 17th November, 1875."

ANGOLA: Brit. Mus. (*Fry Coll.*), 1 specimen.

Allied to *C. anchorago* Suff., but differs in colour, the position of the transverse apical band, and in having no basal band.

*Cryptocephalus picticollis*, sp. n. (Fig. 8.)

Above fulvous, with black markings on the prothorax and elytra, underside entirely black, elytra strongly punctate-striate.

Length 4.5–5 mm.

♂, ♀.—Head black with a fulvous patch between the eyes, not extending to the base, strongly punctured, the punctures closer at the base. Antennæ extending to the middle of the elytra, the five basal segments fulvous, the remainder black. Prothorax very convex, transverse, widest at the base, the sides rounded and contracted in front, impunctate, fulvous, with two black patches curving inwards and meeting in the centre of the prothorax, enclosing a fulvous irregular patch on the basal half. Scutellum black, impunctate, the apex raised. Elytra with the sides slightly tapering to the apex and rounded at the apex, fulvous, with four black spots, two at the base and two at the apex on each elytron, suture narrowly black. Male with the two apical spots touching, strongly punctate-striate. Legs black, with the tibiae fulvous. Underside black, rugosely punctured, clothed with silver pubescence. Female with a deep fovea on the apical ventral segment.

**N.E. RHODESIA:** On road from Fort Jameson to Lundazi, 4000 ft., 7-14. vi. 1910 (*Dr. S. A. Neave*), 1 specimen (♀).

**NYASALAND.** Mombera District, 4000 ft., 15-19. vi. 1910 (*Dr. S. A. Neave*), 1 specimen (♂).

Allied to *C. rhombifer* Suff., but differs in the position of the elytral spots and the pattern on the prothorax.

*Cryptocephalus andersoni*, sp. n. (Fig. 9.)

Flavous, a black spot at the base of the head, two black patches or four black spots on the prothorax, four black spots on each elytron, which are sometimes connected, and a transverse black band near apex.

Length 5.5-6 mm.

♂, ♀.--Head flavous, with a black spot at the base, rugosely but not deeply punctured. Antennæ slender, extending beyond the base of the elytra, the five basal segments flavous, the remainder black. Prothorax transverse, widest at the base, slightly contracted in front, impunctate, nitid, flavous, with two longitudinal black patches contracted in the middle, in the female forming four black spots. Scutellum black, impunctate, subtriangular, with the apex raised. Elytra with the sides slightly tapering to the apex, flavous, with a large black spot at the shoulder, another at the middle, and a transverse irregular black band near the apex, or the band broken and forming two spots, the suture very narrowly black, strongly punctate-striate, the male with a black patch at the base of the pygidium, the female entirely flavous. Legs flavous. Underside of male black, female flavous.

**BRITISH E. AFRICA:** Valley of Upper Nzoia River, N. Kavirondo, 5400 ft., 5-7. vi. 1911 (*Dr. S. A. Neave*), 2 specimens.

**BRITISH E. AFRICA:** Nandi Plateau, 5700-6200 ft., 30. vi. 1911 (*Dr. S. A. Neave*), 1 specimen.

**KENYA COLONY:** Trans Nzoia, 10. v. 1919 (*T. J. Anderson*), 1 specimen.

**KENYA COLONY:** Kitale, vii. 1932 (*Dr. V. G. L. van Someren*), 1 specimen.

This is a very variable species, as the spots can become connected to form a longitudinal and transverse band on the elytra. The female is larger and broader, with the underside flavous.



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XVI.—*On the Lower Carboniferous Corals: Zaphrentites crassus and Z. tenuis, spp. n.* By R. G. S. HUDSON.

[Plate I.]

Most of the species now included in the genus *Zaphrentites* Hudson have been shown by Carruthers (1910) to belong to a phylogenetic series in which *Z. delanoueï* is the earliest known member and *Z. shumnerensis* the last (Hudson, 1943 b). Three described species of the genus are, however, characterized by structures which have no place in the morphogenetic succession of the main lineage. These are *Z. laurstonensis*, considered by Carruthers (1910, p. 534) to be a member of a "short-lived side-branch from the direct line of evolution," and *Z. carruthersi* and *Z. precarruthersi*, considered by Hudson (1941, p. 308) to be respectively aberrant forms of the species *Z. disjunctus* and *Z. pseudoparallelus*, two structurally advanced members of the phylogenetic series. The variation of these two aberrant forms was, I suggested, conditioned by an abnormal environment. Two other forms of the *Z. delanoueï* plexus have been recently collected from the Lower Viséan (C<sub>2</sub>) of the Craven Lowlands. Both show characters not in accord with the morphological succession in the *Z. delanoueï*–*Z. shumnerensis* lineage: one, *Z. tenuis*, sp. n., is considered to be a member of a closely related parallel lineage; the other, *Z. crassus*, sp. n., is

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considered to be an aberrant form of an early member of the main lineage.

The septal formula and terminology used in the following descriptions are those defined by me in a previous paper (Hudson, 1936). The photographs reproduced on Pl. I. were taken by J. Rhodes of the Geological Survey, and to him I record my thanks.

### ZAPHRENTITES Hudson, 1941.

*Genotype.*—*Zaphrentis parallela* Carruthers, 1910. For diagnosis of genus, see Hudson (1944) and the diagnoses of the *Zaphrentis delanoei* species-group by Hill (1940, p. 144) and Hudson (1941, p. 291).

The authors of the species of *Zaphrentites* mentioned in this paper are as follows:—*Z. breviseptum* (Hudson), *Z. carruthersi* (Hudson), *Z. contractus* (Carruthers), *Z. crassus* sp. n., *Z. delanoei* (Edwards and Haime), *Z. disjunctus* (Carruthers), *Z. lauretonensis* (Carruthers), *Z. parallelus* (Carruthers), *Z. precarruthersi* (Hudson), *Z. pseudoparallelus* (Hudson), *Z. shunpetensis* Hudson, *Z. tenuis*, sp. n.

### *Zaphrentites tenuis*, sp. n.

(Pl. I. figs. 2 a-d.)

*Zaphrentis cf. disjuncta* Carruthers—Smyth, 1915, p. 555, pl. xxxvi. fig. 12.

*Holotype.*—Specimen G.S. 63297 \* and transverse sections G.S. 63297 a-d (Pl. I. figs. 2 a-d) from Butterhaw Quarry, Gargrave, near Skipton, Yorkshire: *Rhopalasma* Shale, Broughton Beds, C<sub>2</sub> zone, Lower Viséan. *Paratype.*—B.M.R. 34866 a and b from the basement boulder bed, Halton-East Quarry (west quarry), near Skipton: Embsay Limestone, C<sub>2</sub> zone, Lower Viséan.

*External characters.* Slightly curved trochoid corals, about 30 mm. long and 12 mm. wide. Epitheca with fine growth annulations and sometimes faint septal grooves. Calyx not well seen, about 7 mm. deep. Cardinal sectors on concave side of corallum.

*Internal characters.*—The septal plan is at first zaphren-toid, *i. e.* with the major septa pinnately arranged and enclosing a wide cardinal fossular area (Pl. I. fig. 2 a); then allotropiophylloid, *i. e.* with the counter and counter-lateral septa still pinnately arranged and joining at their

\* Numbers preceded by the letters G.S. or B.M. are the registration numbers of specimens in the respective collections of the Geological Survey and Museum, or the British Museum (Natural History).

axial ends but with the cardinal-laterals not in contact, roughly parallel, and directed towards the counter side of the corallum (Pl. I. fig. 2 *b*); and, finally, amplexoid, *i. e.* with the septa radially arranged and axially free, varying in length according to distance above the tabula on which they rest (Pl. I. fig. 2 *d*).

From a very early stage the major septa are convex to the cardinal septum and pinnately grouped with marked cardinal and alar fossulae. The septal axis is at first central but rapidly becomes excentric being, at the end of the zaphrentoid stage, about one-third the diameter of the corallum from the counter side. The cardinal septum at first extends to the septal axis, but rapidly thins and shortens to about one-third the corallum diameter. Contratingent counter-minors appear early and reach half the length of the counter-laterals. There is little or no septal dilatation and the interseptal loculi are open and, immediately following the brephic stage, contain tabulae. The septal plan (Pl. I. fig. 2 *a*) is very similar to that of *Z. delanouvii*.

The allotropiophylloid stage begins at about 6 mm. corallum diameter (Pl. I. fig. 2 *b*; K, 5 KL, 4 CL, C). The larger rhopaloid first-counter-laterals, noticeable in the zaphrentoid stage, are very evident here while the counter-minors are nearly as long as the counter-septum. The tabulae, which are only slightly compound, slope downwards from the septal axis. In some ways the septal plan at this stage resembles that of *Z. parallelus*, since the cardinal-laterals are long and the cardinal fossular area is mainly bounded by the two last-formed ones: it is not, however, completely enclosed by septa.

In the amplexoid stage the tabulae are flat-topped round the corallum axis and then slope downwards. The major septa are at first slightly convex to the cardinal septum but later are straight and radially arranged. They are also slightly rhopaloid, KL1 and CL1 being more so than the rest. Where the septa rest on a tabula they are more rhopaloid and tend to coalesce as in the left cardinal-lateral and the right counter-lateral sectors shown in Pl. I. fig. 2 *c*. Immediately underneath a tabula they are longer and axially thin as in the counter-lateral sectors shown in Pl. I. fig. 2 *d*. In the ephebic stage (Pl. I. fig. 2 *d*; 8 mm. diam.; K, 6 KL, 4 CL, C)

they are markedly tachylasmoid with KL1 and CL1 as the dominant septa and with the counter reduced in length. The counter-minors are free and other minor septa appear but are stumpy. The septal plan at this stage is identical with that of *Z. disjunctus* (text-fig. 1 and Carruthers, 1910, pl. xxxvii. figs. 7a, 7b) except that the minor septa of *Z. tenuis* are stronger.

*Discussion.* Analysis of the structural change during the ontogeny of *Z. tenuis* shows that it is due to a change from bilateral to radial symmetry and a shortening of the septa: in the zaphrentoid stage the septal plan is bilateral and the septa long; in the allotropiophylloid stage the plan is still bilateral, but the cardinal lateral septa have shortened; in the late amplexoid stage the plan is radial and all septa are shortened. This structural succession is not that occurring in the ontogeny of any of the members of the *Z. delanoei*-*Z. shunnerensis* lineage, nor is it that shown by the ephelic structures in that lineage, though the succession of structure is also due to a change from bilateral to radial symmetry and a shortening of the septa [see Hudson, 1941, where these changes are grouped as those of (a) septal plan, and (b) septal length and contact]. In the *Z. delanoei*-*Z. shunnerensis* lineage the change towards radial symmetry comes first and results in the successive ephelic structures of *Z. parallelus* and *Z. constrictus*. The shortening of the septa follows and results in *Z. pseudoparallelus*, *Z. disjunctus*, *Z. brevisseptum* and *Z. shunnerensis*. In *Z. tenuis*, however, the shortening of the septa commences immediately after the *delanoei* stage and is followed by the change towards radial symmetry, the final structure being similar to that of the ephelic *Z. disjunctus*. *Z. tenuis* and *Z. disjunctus* are thus ephelic homœomorphs. Smyth (1915) recorded as *Zaphrentis* cf. *disjuncta* a form which I consider to be *T. tenuis*. He noted the occurrence of a *delanoei* septal plan in the neanic stage and the absence of one of *constricta*. His specimens were from the Rush Conglomerate (Lower C<sub>2</sub>) of Co. Dublin, Ireland.

Forms similar to *Z. tenuis* occur in slightly earlier beds than those of the type horizons, and it seems probable that *Z. tenuis* is a member of a lineage early divergent from that of *Z. delanoei*-*Z. shunnerensis*. The possi-

bility that such a lineage persists into the uppermost Viséan and lowest Namurian is suggested by the occurrence of allotropiophylloid corals such as that called *Allotropiophyllum tuberculatum* (Thomson) by Hill (1940). A possible early form in the lineage is such as G.S. 71574 found with the holotype of *Z. tenuis*. In this specimen, which has not developed beyond the allotropiophylloid growth-stage, the minor septa, which occur early in that stage, are contratingent—also, the counter-septum, distinguished by the counter-minors, is between the concave and convex sides of the corallum. In spite of this it is the septa on the concave side, not necessarily the cardinal-laterals, which become free, and those on the convex side, not necessarily the counter-laterals, which remain in contact. It seems that the orientation of the septal plan is closely connected with the curvature of the corallum.

***Zaphrentes crassus*, sp. n.**

(Pl. I. figs. 1 *a-d*; text-fig. 1 C.)

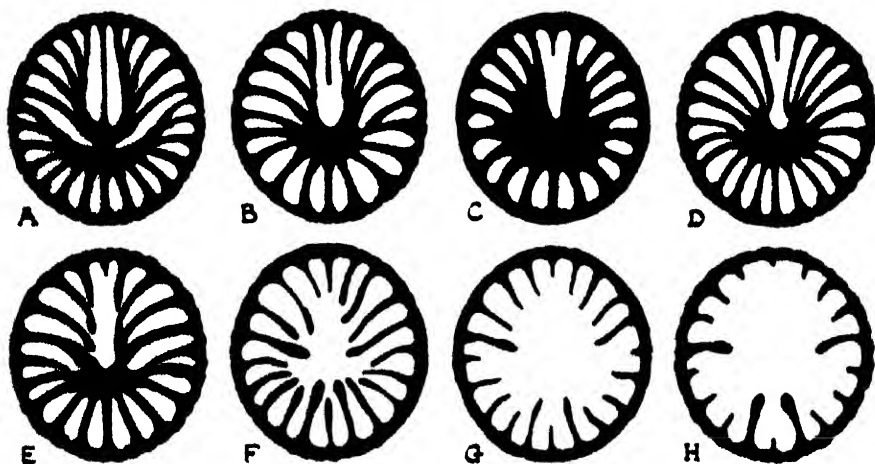
*Holotype*.—Specimen G.S. 63309 and transverse sections G.S. 63309 *a d* (Pl. I figs. 1 *a-d*). *Paratypes*.—Specimens G.S. 71575 and *a-d*, G.S. 71760 and *a*, and B.M.R. 34865 *a* and *b*. G.S. 63309 and 71575 are from Butterhaw Quarry, Gargrave, near Skipton, Yorkshire: *Rhopalasma* Shale, Broughton Beds, C<sub>2</sub> zone, Lower Viséan. G.S. 71760 and B.M.R. 34865 are from the basement boulder bed, Halton-East Quarry (west quarry), near Skipton: Embsay Limestone, C<sub>2</sub>, Lower Viséan.

*External characters*.—Slightly curved trochoid corals, 13 mm. wide and 25 mm. long, or smaller. Epitheca with fine growth annulations and faint septal grooves. Calyx deep with thin walls. Twenty-two short and stout major septa, slightly convex to a short cardinal septum. Cardinal fossulae on concave side of corallum, deep, and open to central non-septate area.

*Internal characters* as seen in transverse section.—The early growth-stages of the corallum have not been clearly seen, but there appears to be complete dilatation of the septa up to 3 mm. diameter. At that diameter the septa are pinnately arranged with the counter-laterals shorter than the cardinal-laterals, and there are marked alar

fossulae and a V-shaped cardinal fossular area which is slightly swollen at its axial end. From that diameter the peripheral parts of the cardinal fossulae and the other interseptal loculi are open, thus forming a large stereo-column, often partly penetrated by the cardinal fossulae; there is also an increase in the difference in length between the cardinal-lateral and counter-lateral septa. At 5 mm. diameter (G.S. 71575 *b*; K, 5 KL, 3 CL, C) the cardinal fossular area is reminiscent of that of *Z. delanouei* except that the axial part is filled with sclerenchyme.

Text fig. 1



Diagrams showing change in septal plan in the *Zaphrentes* plexus due to gradual replacement of long by short septa and of bilateral by radial symmetry. A, *Zaphrentes delanouei* (Z); B, *Z. parallelus* (C<sub>1</sub>); C, post-*parallelus* growth-stage of *Z. crassus* (C<sub>2</sub>); D, *Z. constrictus* (? E<sub>1</sub>); E, *Z. pseudoparallelus* (E<sub>1</sub>); F, *Z. disjunctus* (E<sub>2</sub>); G, *Z. brevisseptum* (E<sub>2</sub>); H, *Z. shunnerensis* (E<sub>3</sub>).

The outline of the cardinal fossular area now changes as the cardinal-laterals lengthen and their curvature decreases: the area thus becomes open for the greater part of its length, parallel-sided, and is bisected by a cardinal septum which is beginning to shorten. Its outline is partly determined by a lining of lamellar sclerenchyme (G.S. 63309 *a*; Pl. I. fig. 1 *a*; K, 5 KL, 3 or 4 CL, C). The septal axis is about a quarter of the corallum diameter from the counter side, and the counter and counter-lateral septa, progressively shorter from the

counter-septum, join axially and form a crescent-shaped structure lined by lamellar sclerenchyme. The general septal plan is that of *Z. parallelus*. From now on all septa are more radial, the septal axis is less excentric and the cardinal fossular area widens, first at the periphery, and becomes narrowly V-shaped. At 7.5 mm. diameter (G.S. 71575 c ; K, 5 KL, 3 CL, C) the V-shaped cardinal fossular area is 2.5 mm. long, and its open part penetrates about 1 mm. into a stereocolumn which is about 4 mm. wide and which is composed of the axial ends of the septa and the axial lining and infilling of the cardinal fossulae. The cardinal septum is short. In a slightly later growth-stage (G.S. 63309 b, 8.5 mm. diam., Pl. I fig. 1 b, and G.S. 71575 d, 8.5 mm. diam., K, 6 KL, 3 CL, C) the open cardinal fossular area, 4.2 mm. long and still narrowly V-shaped, extends to the corallum axis though not to the septal axis, which is still excentric. The cardinal septum is very short and there is a slight shortening of the cardinal-laterals, thus slightly widening axially the cardinal fossular area. The counter-laterals are about one-quarter of the corallum diameter. The crescentiform stereocolumn, which is still built of the adjoining ends of the counter-laterals and the axial lining of the cardinal fossulae, is about half the corallum diameter. The general septal plan, apart from the size of the stereocolumn, is intermediate between that of *Z. parallelus* and *Z. constrictus*, being nearer the former than the latter. Some specimens (as G.S. 71575 and 71760) do not advance beyond this growth-stage, which may be called the *post-parallelus* stage.

Other specimens (as G.S. 63309 and B.M.R. 34865) continued beyond this growth-stage with a corallum which is straight and in which there is only slight increase in diameter. In transverse sections at this growth-stage (Pl. I. fig. 1 c. ; 10 mm. diam., K, 5 KL, 4 CL, C) the septa are almost straight and about one-third the corallum diameter, the septal axis is almost at the centre of the corallum, the counter-laterals are radially arranged, and the cardinal-laterals are nearly so. The shortening of the septa and some reduction of the axial sclerenchyme have opened up a non-septate central area which is continuous with the cardinal fossulae. This septal plan is due, as are the earlier ones, to a change from bilateral

towards radial symmetry and to a reduction of the length and thickness of the septa. Normally this reduction of the septal thickness takes place before the main shortening and adoption of radial symmetry, so that the septa at that growth-stage are short, radial and free. In *Z. crassus*, however, the septal dilatation persists into that growth-stage giving the septal plan shown in Pl. I. fig. 1 c. Subsequent reduction of the thickness of the septa and the elimination of the axial sclerenchyme results in almost straight, radial and axially free septa with length about one-third the corallum diameter (Pl. I. fig. 1 d · 11 mm. diam., K, 6 KL, 3 CL, C; in this section the cardinal and the cardinal-lateral septa rest on a tabula and, as usual in such cases, are slightly longer than normally). In the holotype rejuvenescence takes place after this stage, and the septal plan at the base of the calyx (U.S. 63309) is similar to that of an earlier growth-stage (as in Pl. I. fig. 1 c).

*Discussion.*—The ephebic septal plans of the various members of the *Zaphrentes delanoei* plexus are shown in text-fig. 1. The septal plan of the post-*parallelus* stage of *Z. crassus* (fig. 1 C) is also included, and it will be seen that its position is between that of *Z. parallelus* (fig. 1 B) and that of *Z. constrictus* (fig. 1 D). This position is confirmed by (a) the ontogeny of *Z. crassus*, for in it a post-*parallelus* follows a *parallelus* septal plan; (b) by the ontogenies of later members of the plexus, for in them fossulae of post-*parallelus* outline (Carruthers, 1910, pl. xxxvii. figs. 5 c and 6 e), can often be distinguished immediately before those of *constrictus* outline (Carruthers, 1910, pl. xxxvii. figs. 5 a and 6 d; and (c) by the stratigraphical position of *Z. crassus* following as it does, that of the acme of *Z. parallelus* [specimens U.S. 71576 and 71761-3, found with *Z. crassus*, may be young individuals of that species or mature *Z. parallelus*]. *Z. crassus* differs from other members of the plexus by its larger size and thicker septa, by the presence of axial sclerenchyme and, in certain specimens, by the continued growth of the corallum after the post-*parallelus* stage. Comparison of the structure of *Z. crassus* with that of other members of the plexus suggests that the post-*parallelus* stage is the ephebic growth-stage of the species, and that the further



growth of the corallum and the change in septal plan shown by some specimens are post-ephebic phenomena comparable in many respects to those exhibited by the lengthy cono-cylindrical coralla of *Caninia cornucopiae* Michelin (see Carruthers, 1908) or those of *Rhopalolasma bradbournense* (Wilmore)—see Hudson, 1943. It has been suggested that the cylindrical stage of such coralla is due to some environmental factor, a suggestion which best explains the occurrence of the post-ephebic corallum of *Z. crassus*. The dilatation of the septa and the large crescentiform stereocolumn which occur in all growth-stages of that species are probably due to abnormal deposition of sclerenchyme, a phenomenon which is also usually considered to be consequent on some environmental factor. The environmental influence might have been a purely physical or a chemical one stimulating the secretion of skeletal material, a suggestion which is supported by the increased dilatation seen in most other forms in the faunas in which *Z. crassus* is found. The corallum of that species is slightly less curved than those of other members of the plexus, and the abnormal structure of the species may have been the response to the stimulus of an early stable and upright position or it may have been a factor partly conditioning such a position.

*Z. crassus* is therefore considered to be an aberrant form of a member of the *Z. delanouei* plexus intermediate between *Z. parallelus* and *Z. constrictus*.

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## EXPLANATION OF PLATE I.

*Zaphrentites*.

All figures on Pl. I are of transverse sections of specimens from Butterhaw Quarry, Gargrave, near Skipton, Yorkshire: *Rhopalolasma* Shale, Broughton Beds, C<sub>2</sub> zone, Lower Viséan. K, counter-septum; KL 6, sixth counter-lateral; C, cardinal septum; CL 1, first cardinal-lateral; Km, counter-minor septum. In some of the figures the interseptal loculi have been cleared.

Fig. 1. *Zaphrentites crassus*, sp. n. Holotype, G.S. 63309. Fig. 1 a, G.S. 63309 a,  $\times 7$ , neanic ("parallelus") growth-stage; fig. 1 b, G.S. 63309 b,  $\times 6$ , ephebic stage, note V-shaped cardinal fossular area; fig. 1 c, G.S. 63309 c,  $\times 6$ , early post-ephebic stage; fig. 1 d, G.S. 63309 d,  $\times 5$ , late post-ephebic stage.

Fig. 2. *Zaphrentites tenuis*, sp. n. Holotype, G.S. 63297. Fig. 2 a, G.S. 63297 a,  $\times 7$ , early neanic stage, zaphrentoid septal plan, note prominent counter-minors; fig. 2 b, G.S. 63297 b,  $\times 7$ , allotriophylloid septal plan on left side, fig. 2 c, G.S. 63297 c,  $\times 6$ , amplexoid septal plan; fig. 2 d, G.S. 63297 d,  $\times 6$ , ephebic growth-stage.

XVII.—*New or little-known Tipulidæ (Diptera).—LXIX.*  
*Neotropical Species.* By CHARLES P. ALEXANDER,  
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 Massachusetts, U.S.A.

THE species discussed herewith are all from Peru, where they were collected by my friends, Mr. Pedro Paprzycki and Mr. Felix Woytkowski, who have added most materially to our knowledge of the crane-fly fauna of the country. I am indebted to the collectors for the privilege of retaining all types in my private collection of World Tipulidæ.

*Limonia (Limonia) horrenda*, sp. n.

Size large (wing, male, over 13 mm.); general coloration of mesonotum brown, the thoracic pleura stripes with dark brown and pale yellow; halteres brownish black;

legs black, the extreme tips of femora whitened; wings brownish yellow, conspicuously patterned with dark brown; *Rs* square and long-spurred at origin; male hypopygium with the rostral spines of the ventral dististyle broadly flattened, at their tips produced into hair-like points.

*Male*. --Length about 11 mm.; wing 13.5 mm.

Rostrum and palpi black. Antennæ black throughout; flagellar segments oval, passing through long-oval to subcylindrical, with very short, glabrous, apical pedicels, the first flagellar segment with a slender glabrous base; terminal segment elongate, more than one-half longer than the penultimate, strongly constricted beyond mid-length; flagellar segments with one outstanding verticil on each segment, these unilaterally distributed. Head brownish black, the anterior vertex silvery grey; anterior vertex very narrow, only about one-fourth the diameter of scape, the eyes correspondingly large.

Pronotum dark brown. Mesonotum chiefly dark brown, the humeral and lateral portions of præscutum broadly obscure yellow; mediotergite obscure brownish yellow behind, the cephalic portion sparsely pruinose. Pleura pale yellow, striped longitudinally with brownish black, including a complete dorsal stripe extending from the propleura and ventral pronotum, across the dorsal mesopleura, through the pleurotergite to the postnotum; ventral sternopleurite less distinctly infuscated; dorso-pleural region narrowly yellow. Halteres brownish black, the base of stem narrowly yellow. Legs with coxæ yellow, the extreme bases of the fore and middle pairs a little darker; trochanters yellow; remainder of legs black, the fore femora a little paler basally; extreme tips of all femora very narrowly whitened; claws conspicuously toothed. Wings brownish yellow, conspicuously patterned with dark brown, including the oval stigma and clouds at origin of *Rs*, fork of *Sc*, and as broad seams along cord and outer end of cell 1st  $M_2$ ; wing-tip and cells *R* and *M* much less clearly darkened; veins light brown, darker in the patterned areas. Venation: *Ss* long, *Sc*<sub>1</sub> ending about opposite three-fourths *Rs*, *Sc*<sub>2</sub> near its tip; *Rs* square and long-spurred at origin; free tip of *Sc*<sub>2</sub> in approximate transverse alignment with *R*<sub>2</sub>; basal section of *R*<sub>3</sub> strongly arcuated, the inner ends

of cells  $R_3$  and 1st  $M_2$  lying proximad of cell  $R_3$ ; cell 1st  $M_2$  elongate, exceeding in length any of the veins beyond it; *m-cu* close to the fork of  $M$ .

Abdominal tergites brownish black segments one and base of two obscure yellow; sternites more evidently brightened, black, the caudal borders of the proximal three or four segments yellow; hypopygium chiefly blackened, the ventral dististyle paler. Male hypopygium (fig. 1) with the tergite, 9t, transverse, the caudal margin with two broadly rounded lobes that are provided with several unusually long strong setae. Basistyle, *b*, with the ventromesal lobe very broad and obtuse. Dorsal dististyle, *dd*, a strong rod, its decurved head terminating in an acute spine, the surface glabrous except near base. Ventral dististyle, *vd*, with the main body a relatively small fleshy lobe, its outer portion provided with abundant strong setae, including one or two of unusual length on a small tubercle near base of rostrum rostral prolongation of style at base with numerous silken setulae, the two usual spines widely separated, each broadly flattened and produced into a hairlike point; rostral prolongation relatively narrow, obtuse at apex. Gonapophyses, *g*, with the mesal-apical lobe a nearly straight blackened rod.

*Hab.* Peru (Ayacucho).

*Holotype*, ♂, Tambo. La Mar, altitude 3700 metres, July 26, 1941 (Woytkowski).

In its general appearance, the present fly resembles species such as *Limonia* (*Limonia*) *grossa* Alexander, *L. (L.) pernobilis* Alexander, and others, but from the structure of the male hypopygium it evidently is more allied to the various species that centre around *L. (L.) lawlori* Alexander, including *L. (L.) immodica* Alexander, *L. (L.) voraima* Alexander, and others, from all of which it differs conspicuously in the coloration of the body, legs and wings, and in the structure of the male hypopygium.

*Limonia* (*Dicranomyia*) *præcellens*, sp. n.

Size large (wing, male, over 8 mm.): antennae with scape and pedicel yellow, flagellum black; general coloration grey, the præscutum with four poorly differentiated darker stripes; halteres long and slender; legs yellowish brown to brown, outer tarsal segments black; wings brownish yellow, restrictedly patterned with darker,

including a conspicuous brown stigma;  $Sc_1$  long, one-half or more as long as  $R_8$ ;  $m-cu$  before fork of  $M$ ; abdomen bicoloured, the segments dark brown, with yellow borders,

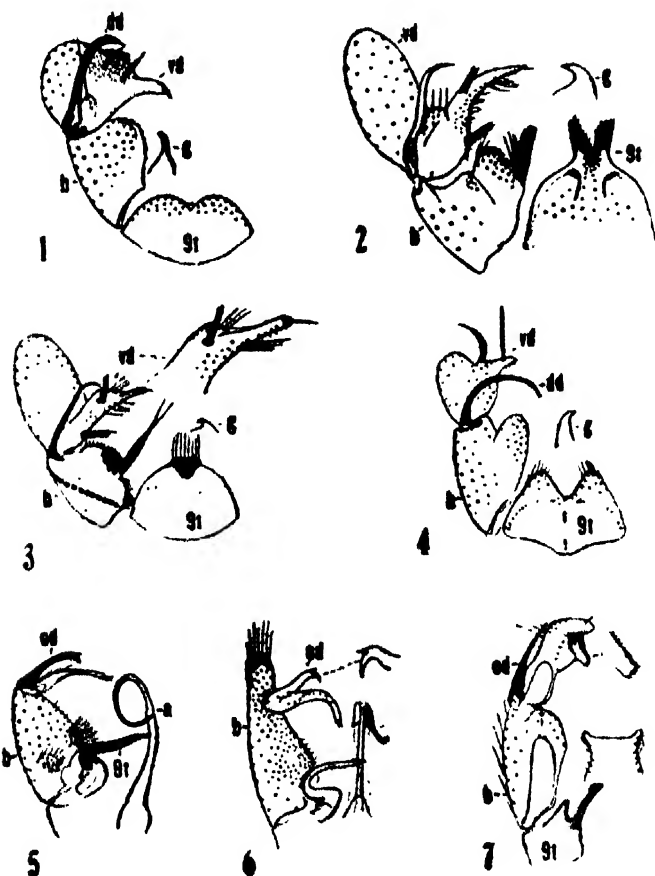


Fig. 1. —*Limonia (Limonia) horrenda*, sp. n.; male hypopygium.  
 Fig. 2. —*Limonia (Dicranomyia) praeclens*, sp. n.; male hypopygium.  
 Fig. 3. —*Limonia (Dicranomyia) quadrigladi*, sp. n.; male hypopygium.  
 Fig. 4. —*Limonia (Dicranomyia) nefasta*, sp. n.; male hypopygium.  
 Fig. 5. —*Helius (Helius) regius*, sp. n.; male hypopygium.  
 Fig. 6. —*Helius (Helius) productellus*, sp. n.; male hypopygium.  
 Fig. 7. —*Helius (Helius) acanthostyla*, sp. n.; male hypopygium.

(Symbols; *a*, aedeagus; *b*, basistyle; *dd*, dorsal dististyle; *g*, gonapophysis; *id*, inner dististyle; *od*, outer dististyle; *t*, tergite; *vd*, ventral dististyle.)

those of the sternites broader; male hypopygium complex; ninth tergite conspicuously notched medially, produced into two submedian lobes that are conspicuously fringed with pale spinous setæ; ventral dististyle and basistyle with groups of modified setæ.

*Male*.—Length about 8–8.5 mm. ; wing 8.5–9 mm.

Rostrum and palpi black. Antennæ with scape and pedicel yellow, the former a trifle pruinose ; flagellum black ; basal flagellar segments short-oval, the outer segments much more elongated, the terminal segment about one-third longer than the penultimate ; verticils of the more proximal segments slightly conspicuous, on the outer segments much smaller. Head clear light grey, slightly more infuscated on either side of posterior vertex ; anterior vertex moderately wide, about two and one-half times the diameter of scape.

Pronotum light brown, somewhat darker and more pruinose behind. Mesonotum almost uniform dark grey, the præscutum with four scarcely to feebly differentiated darker brownish grey stripes ; central portion of scutum, the scutellum and postnotum lighter grey. Pleura brownish grey, sparsely pruinose, with indications of a paler area on the sternopleurite and meral region ; a conspicuous dark brown spot on ventral anepisternum, extending forward on to the anterior coxa ; ventral sternopleurite a little darkened. Halteres long and slender, blackened, the base of stem restrictedly yellow. Legs with the fore coxæ darkened, as described, the other pairs yellowish brown ; trochanters obscure yellow ; remainder of legs long and slender, yellowish brown to brown, the outer tarsal segments passing into black. Wings with a strong brownish-yellow ground, the costal and outer radial fields even more saturated ; a relatively small but conspicuous dark brown stigma ; a restricted brown cloud at origin of *Rs* and along cord and outer end of cell 1st  $M_2$  ; veins yellow, darker in the patterned areas. Venation : *Sc* short,  $Sc_1$  ending opposite origin of *Rs*,  $Sc_2$  some distance from its tip,  $Sc_1$  alone being from more than one-half to two-thirds the length of *Rs* ; cell 1st  $M_2$  relatively small, rectangular ;  $M_{3+4}$  subequal to  $M_4$  ; *m-cu* shortly before fork of *M*.

Abdominal tergites dark brown, the caudal borders of the segments narrowly yellow ; ninth tergite more uniformly pale ; sternites broadly yellow at apices, their bases narrowly darkened. Male hypopygium (fig. 2) with the ninth tergite, 9t, narrowly outwardly, terminating in two conspicuous submedian lobes that are separated

by a V-shaped notch, the lobes and margin fringed with strong spinous yellow setæ. Basistyle, *b*, with the ventromesal lobe broad at apex, its cephalic portion with a strong brush or pencil of flattened yellow setæ; the more caudal portions of the lobe with shorter, more normal setæ and an apical row of short curved flattened spinous setæ. Dorsal dististyle a gently curved rod, constricted on proximal third, narrowed to the long spined tip. Main body of ventral dististyle, *vd*, a large fleshy lobe that is loosely joined to the rostral portion, the latter with the two spines nearly appressed, placed before mid-length of the prolongation; ventral portion of prolongation with several spines, including a more basal tuft or pencil. Gonapophyses, *g*, with mesal-apical lobe relatively short and simple.

*Hab.* Peru (Ayacucho).

*Holotype*, ♂, Yanamonte, La Mar, altitude 3000-4100 metres, in fog forests, September 9, 1941 (*Woytkowski*).  
*Paratopotype*, ♂, September 10, 1941 (*Woytkowski*).

Despite its very different general appearance, the present fly seems to be most nearly related to *Limonia* (*Dicranomyia*) *bigludia* Alexander. It differs in its large size, patterned wings, and, especially, in the structure of the male hypopygium, as the tergite, basistyle and ventral dististyle.

*Limonia* (*Dicranomyia*) *quadrigludia*, sp. n.

Allied to *bigludia*; general coloration of mesonotum brownish grey, the præscutum with a broad, dark brown, median stripe; rostrum and antennal scape yellow; anterior vertex relatively wide, silvery white; halteres very long, subequal in length to the thorax; wings buffy, unpatterned; *Sc*<sub>1</sub> about equal in length to *Rs*; male hypopygium with the tergite terminating in two closely applied submedian groups of setæ; each basistyle, in addition to other armature, provided with two powerful flattened setæ of unusual length.

*Male*.—Length about 7 mm.; wing 8 mm.

Rostrum yellow; palpi black. Antennæ with scape light yellow; pedicel light brown; flagellum black; flagellar segments long-oval to subcylindrical; verticils shorter than the segments. Head grey, the broad front

more silvery white: anterior vertex about twice the diameter of scape.

Pronotum dark brown, paling to buffy on sides. Mesonotum generally brownish grey; præscutum with a broad conspicuous, dark brown, median stripe and very restricted and ill-defined lateral stripes, the humeral region more buffy; scutal lobes brownish grey; central region of scutum and scutellum more whitened; postnotum light grey pruinose. Pleura buffy grey; a small darkened spot on border between anepisternum and sternopleurite. Halteres very long and slender, about equal in length to the entire thorax, black, the extreme base of stem paler. Legs with the coxae pale, sparsely pruinose, fore and posterior pairs a trifle darker; trochanters obscure yellow, remainder of legs brownish yellow, the outer segments passing into black. Wings buffy, the stigma not differentiated; prearcular and costal fields a little more yellow, best evidenced by the more yellowish veins. Venation. *Sc* short, *Sc*<sub>1</sub> ending shortly before origin of *Rs*, *Sc*<sub>2</sub> far from its tip, *Sc*<sub>1</sub> alone subequal to or a little longer than *Rs*; cell 1st *M*<sub>2</sub> about as long as vein *M*<sub>4</sub>; *m-cu* a short distance before fork of *M*.

Abdominal tergites dark brown, the outer tergites a little paler; sternites yellow, with more darkened basal rings; hypopygium somewhat paler. Male hypopygium (fig. 3) with the tergite, 9t, large, suboval in outline, the convex caudal portion with two closely appressed submedian lobes that are densely set with long setæ, there being a total of about forty of these; major setæ of surface of tergite more or less restricted to a transverse row at near mid-length. Basistyle, *b*, with the ventromesal region complex, with a broad low lobe that is densely set with short spinous setæ and two closely approximated elongate flattened spinous setæ; cephalad of these latter with a low cushion fringed with long pale setæ; across face of body of style with an oblique row of about ten to twelve powerful setæ. Dorsal dististyle a slender delicate pale rod that terminates in an acute tip. Ventral dististyle, *vd*, relatively large, the main lobe loosely connected with the rostral portion, the latter broad, at near two-thirds its length suddenly narrowed to a cylindrical point; rostral spines two, of moderate length, directed outward; near base of rostral prolongation on margin with a small brush



or tuft of setæ. Gonapophyses, *g*, with the mesal-apical lobe unusually short and inconspicuous.

*Hab.* Peru (Junin).

*Holotype*, ♂, Huasahuasi, Tarma, altitude 2800 metres, April 15, 1940 (*Woytkowski*).

The nearest ally is *Limonia* (*Dicranomyia*) *bigladia* Alexander, likewise from high altitudes in the Peruvian Andes. This latter differs in all details of structure of the male hypopygium, especially the lobes of the tergite, the single modified seta of each basistyle, and the details of the ventral dististyle

*Limonia* (*Dicranomyia*) *nefasta*, sp. n.

General coloration brownish grey; antennæ black throughout; halteres blackened, base of stem pale; legs obscure yellow, the outer tarsal segments brownish black; wings brownish yellow, the oval stigma pale brown; male hypopygium with tergite conspicuously notched medially; ventral dististyle small, the rostral prolongation with two spines, the outermost slender, straight; inner spine appearing as a flattened curved blade arising from a small basal tubercle.

*Male*.—Length about 6.5–7 mm.; wing 8 mm.

*Female*.—Length about 7–7.5 mm.; wing 8–8.5 mm.

Rostrum obscure testaceous yellow, moderately long and without a well-defined notch between it and the front; palpi black. Antennæ black; flagellar segments oval, the outer ones more elongate. Head brownish grey; anterior vertex a little wider than the diameter of scape.

Pronotum brown. Mesonotal præscutum brownish grey medially, forming a more or less distinct central stripe, the humeral and lateral portions paler; posterior sclerites of notum distinctly pruinose; mesonotum relatively high and gibbous. Pleura pale, sparsely pruinose, the dorsal sclerites darker. Halteres relatively long, blackened, the base of stem pale. Legs with the coxæ and trochanters pale yellow; femora brownish yellow, brighter basally; tibiæ and basitarsi pale brownish yellow, the outer segments passing into brownish black. Wings with a brownish yellow tinge, the oval stigma pale brown; veins brown. Venation: *Sc*<sub>1</sub> ending opposite origin of *Rs*, *Sc*<sub>2</sub> a short distance from its tip, *Sc*<sub>1</sub> alone about equal in length to *R*<sub>2</sub>; cell 1st *M*<sub>2</sub> relatively

large, nearly as long as vein  $M_{1+2}$  beyond it; *m-cu* close to fork of *M*.

Abdominal tergites dark brown, paler laterally; basal sternites pale, the outer segments darker; ovipositor with the cerci long and slender, the acute tips gently upcurved. Male hypopygium (fig. 4) with the tergite, 9t, conspicuously notched medially, each lobe subequal in outline to the notch itself. Basistyle, *b*, with the ventromesal lobe large, simple. Dorsal dististyle, *dd*, a long, slender, strongly curved rod. Ventral dististyle, *vd*, small, its total area from one-half to two-thirds that of the basistyle; rostral prolongation slender, with two widely separated spines, the outer one close to the tip of the prolongation, appearing as a long straight slender spine that exceeds the prolongation in length; inner spine at base of prolongation, appearing as a flattened curved blade arising from a small basal tubercle. Gonapophyses, *g*, with mesal-apical lobe relatively slender.

*Hab.* Peru (Ayacucho).

*Holotype*, ♂, Yanamonte, La Mar, altitude 3000–4100 metres, in fog forests, October 11, 1941 (*Woytkowski*).

*Allotopotype*, ♀, pinned with type. *Paratopotype*, ♀

The nearest relative of the present fly is *Limonia* (*Dicranomyia*) *latispina* Alexander, which has the structure of the male hypopygium, including the tergite, generally similar but differs conspicuously in the nature of the rostral spines, both of which appear as flattened blades. In the present fly, the slender, straight, outer spine is distinctive of the species.

*Helius* (*Helius*) *regius*, sp. n.

Allied to *albitarsis*; size very large (wing, 11 mm. or more); mesonotal præscutum reddish brown, the posterior sclerites and pleura variegated with darker; tarsi with tips narrowly whitened, involving about the distal seventh of the basitarsus, as well as the succeeding segments; wings strongly tinged with brown, the stigma darker; male hypopygium with the tergal arms narrowed on outer portion.

*Male*.—Length about 8.5–9 mm.; wing 11–12 mm.

*Female*.—Length about 9.5 mm.; wing 11 mm.

Rostrum black, relatively long, about one-half longer than the remainder of head; palpi black. Antennæ

black; flagellar segments long-oval to subcylindrical, especially the outer ones; verticils conspicuous, nearly twice the length of segments. Head brownish black, more yellow pollinose in front; anterior vertex (male) narrow, about equal in diameter to scape.

Thoracic dorsum reddish brown in front, the præscutum weakly infuscated medially behind; scutal lobes with their centres conspicuously dark brown; scutellum with disk dark brown, the lateral and posterior borders narrowly pale; mediotergite dark brown on cephalic half, the posterior portion more reddish brown; pleurotergite dark brown. Pleura chiefly darker brown than the dorsum, including the dorsopleural membrane; ventral sternopleurite more brightened. Halteres brownish black, relatively long. Legs with coxæ relatively dark brown, the tips paler, especially of the fore pair; trochanters testaceous yellow; femora and tibiae dark brown; basitarsi dark brown to brownish black, the tips rather narrowly whitened, including about the outer seventh or eighth; remainder of tarsi white; claws simple. Wings with a strong brownish tinge, the elongate stigma still darker brown; costal region and a seam along basal half of vein *Cu* slightly darkened; veins dark brown. Venation: *Sc*<sub>2</sub> ending about opposite *r-m*, faint to sub-atrophied; *r-m* distinct but sometimes very shortened; cell 1st *M*<sub>2</sub> large, approximately as long as vein *M*<sub>4</sub> beyond it; *m-cu* at near mid-length of cell and about opposite *r-m*.

Abdomen black; hypopygium brownish yellow. Ovipositor with valves long and very slender, especially the cerci. Male hypopygium (fig. 5) with the basistyle, *b*, relatively stout, with numerous setæ, including a group of longer, more delicate bristles on cephalic portion of mesal face and a more lateral aggregation of shorter and stouter bristles. Outer dististyle, *od*, small and slender, curved at apex into a strong point, with a smaller, more slender spine on outer face before apex. Inner dististyle longer and more slender, particularly the distal half. Lateral tergal rods, with basal half stout, thence strongly narrowed to the subacute tip, the outer portion apparently subcylindrical rather than strongly flattened, as in various allied species.

*Hab.* Peru (Ayacucho).

*Holotype*, ♂, Yanamonte, La Mar, altitude 3000–4,100 metres, September 10, 1941 (Woytkowski). *Allotopotype*, ♀, September 19, 1941. *Paratopotypes*, 3 ♂♂, September 10–October 1, 1941 (Woytkowski).

*Helius (Helius) regius* is the largest and most conspicuous member of the *albitarsis* group so far discovered. It is best distinguished by this feature and by the details of structure of the hypopygium, especially the tergal arms, and the distribution of setæ on the basistyle

*Helius (Helius) parvirens*, sp. n.

Belongs to the *albitarsis* group; general coloration of mesothorax reddish brown; head black; halteres brownish black; legs brownish black, the tarsi extensively white; wings with a brownish tinge, the oval stigma still darker; male hypopygium with the lateral tergal blades strongly bent before mid-length, thence extended into long flattened points, their tips acute; basistyle with a concentration of unusually long setæ on mesal face near proximal end; outer dististyle shorter than the inner, the apical teeth relatively small; ædeagus elongate.

*Male*.—Length about 6.5 mm.; wing 7 mm.; antenna about 0.9 mm.

Rostrum black, about equal in length to the remainder of head; palpi black. Antennæ unusually short, black throughout; flagellar segments long-oval, with long conspicuous verticils; remaining vestitute unusually short and inconspicuous. Head black; anterior vertex narrow, less than one-half the diameter of scape.

Pronotum infuscated medially, paler on sides. Mesonotum rich reddish brown, the humeral region of præscutum and median region of scutum obscure yellow; scutellum infuscated medially, yellow on sides. Pleura uniform reddish. Halteres brownish black, the base of stem restrictedly yellow. Legs with the coxæ and trochanters yellow; remainder of legs brownish black, the distal third of basitarsi and all succeeding segments white. Wings with a brownish tinge, the oval stigma darker brown; a more or less distinct brown wash across proximal ends of anal and cubital cells, continued along vein *Cu* to near mid-length; veins brown. Venation: *Sc*<sub>1</sub> ending just before fork of *R*<sub>2</sub>, *Sc*<sub>1</sub> atrophied; anterior

branch of  $R_s$  strongly sinuous beneath the stigma;  $r-m$  obliterated by a short fusion of  $R_{4+5}$  and  $M_{1+2}$ ; cell 1st  $M_2$  relatively large, irregularly hexagonal;  $m-cu$  more than its own length beyond fork of  $M$ ; cell 2nd  $A$  relatively narrow.

Abdominal tergites dark brown; sternites obscure yellow. Male hypopygium with the lateral tergal rods strongly bent before mid-length, thence extended into long flattened blades, their tips acute. No lobule on mesal face of basistyle but with a concentration of unusually long setæ near base. Outer dististyle shorter than the inner, the apical teeth relatively small, especially the subterminal one. *Ædeagus* elongate, not blackened, subtended by pale membrane.

*Hab.* Peru (Junin).

*Holotype*, ♂, Satipo, Jauja, altitude 800–900 metres, July 23, 1940 (*Paprzycki*).

*Helius (Helius) parvidens* is closest to species such as *H. (H.) ineptus* Alexander and *H. (H.) lobuliferus* Alexander, differing from both especially in the details of structure of the male hypopygium. For a description of the type region, see *Paprzycki*, 'Revista Chilena Historia Natural,' xlv. pp. 390–392, 3 figs.; 1940.

*Helius (Helius) productellus*, sp. n.

Belongs to the *albitalarsis* group; general coloration of mesonotal præscutum reddish brown, the posterior sclerites of notum and the pleura darker; posterior portion of mediotergite with paired obscure yellow areas; legs black, the outer end of basitarsus and remaining tarsal segments snowy white; wings with a strong brownish tinge, the stigma darker;  $r-m$  distinct,  $m-cu$  lying far distad, male hypopygium with the basistyle produced beyond the origin of dististyles as a stout lobe that is nearly as long as the total length of the outer style.

*Male*.—Length about 7.5 mm.; wing 8.5 mm.

Rostrum and palpi black, the former about as long as remainder of head. Antennæ broken. Head black.

Pronotum brownish black. Mesonotal præscutum reddish brown, without pattern; posterior sclerites of notum darker brown, the median area of scutum and posterior median border of præscutum paler; posterior border of

mediotergite with paired obscure yellow areas. Pleura brown, the dorsal portions, including the dorsopleural membrane, brownish black. Halteres brownish black, the base of stem a trifle paler. Legs with the coxæ dark brown; trochanters a little paler; remainder of legs black, the distal fifth or sixth of basitarsus, together with the remainder of tarsi, white. Wings with a strong brownish tinge, the elongate stigma darker brown; costal border, seams along veins *M* and *Cu*, and the bases of the anal cells less evidently darker; veins dark brown. Venation: *Sc*<sub>2</sub> ending shortly beyond level of *r-m*, *Sc*<sub>1</sub> near its tip, short and subatrophied; *r-m* distinct; *m-cu* far distad, the distal section of *M*<sub>3+4</sub> about two-thirds its length; cell 2nd *A* relatively narrow.

Abdominal tergites dark brown; basal sternites faintly brightened. Male hypopygium (fig. 6) with the basistyle, *b*, produced beyond origin of dististyle as a stout lobe that is almost as long as the total length of the outer dististyle; no other modified lobes on basistyle. Outer dististyle, *od*, at apex strongly curved to an acute point, with a much smaller, slender, subapical spine on outer margin. Inner dististyle longer, darkened throughout its length. *Ædeagus*, *a*, straight, the recurved tip relatively short; the actual *ædeagus* slender, subtended by nearly hyaline membrane that becomes more coloured before the recurved portion. Lateral tergal arms appearing as slender, strongly sinuous rods.

*Hab.* Peru (Ayacucho).

*Holotype*, ♂, Ayna, La Mar, altitude 2400 metres, May 16, 1941 (Woytkowski).

*Helius* (*Helius*) *productellus* is well-distinguished from other generally similar members of the *albitarsis* group by the structure of the male hypopygium, especially the subterminal insertion of the dististyles. All other described species, with the exception of *H. (H.) quadrifidus* Alexander, have the dististyles terminal in position; this latter fly differs conspicuously in the venation and in the details of structure of the male hypopygium. The structure here described as representing a lateral arm or rod of the tergite appears to be this, as it is in the cases of various *Pediciine* genera, the *Dolichopezaria*, *Dicranoptycha*, and certain other groups. The only other homology possible would seem to be that it represents an interbase.

*Helius (Helius) acanthostyla*, sp. n.

Allied to *albogeniculata*; general coloration of entire body black, only the mesonotal præscutum slightly brightened; antennal scape and pedicel black, flagellum abruptly light yellow; femora yellow, with a broad black subterminal ring, the extreme tips abruptly snow-white; tips of tibiæ and the tarsi white; wings brown, more conspicuously so at base and apex; stigma large, darker brown, preceded and followed by more yellowish areas; macrotrichia of veins reduced in number; male hypopygium with the inner dististyle bilobed, one lobe with abundant acute spinulæ.

*Male*.—Length about 4.5 mm.; wing 4.5 mm.

Rostrum a little shorter than remainder of head, polished black; palpi black. Antennæ with scape and pedicel black, flagellum abruptly light yellow, broken at near mid-length; flagellar segments subcylindrical, with elongate verticils that are unilaterally distributed. Head brownish black.

Pronotum black. Mesonotal præscutum dark reddish brown, the remainder of notum and the pleura black. Halteres black throughout. Legs with the coxæ and trochanters black; femora yellow on about the proximal two-thirds to three-fourths, thence deepening to black, the extreme tips abruptly snow-white; tibiæ yellow, a little more obscure on proximal portion, the base narrowly whitened, the tip more broadly so; tarsi similar whitened. Wings conspicuously suffused with brown, especially at the apex and in the prearcular field; costal field more yellowish, expanded and conspicuous immediately before and beyond the large, oval, darker brown stigma; veins brown, more yellow in the brightened fields. Macrotrichia of veins reduced in number, lacking basad of origin of *Rs* except on *C*; beyond the cord with scattered series of trichia on veins  $R_3$ ,  $R_{4+5}$ , and the distal sections of  $M_{1+2}$  and  $M_3$ . Venation: *Sc* relatively short,  $Sc_1$  ending shortly beyond mid-length of *Rs*,  $Sc_2$  close to its tip; branches of *Rs* diverging near outer ends, so cell  $R_3$  at margin is more extensive than cell  $R_2$ , both wide; *r-m* distinct; cell 1st  $M_3$  narrowed outwardly, subequal in length to vein  $M_4$  beyond it; *m-cu* about two-thirds its length beyond the fork of *M*; cell 2nd *A* of moderate width.

**Abdomen**, including hypopygium, black. Male hypopygium (fig. 7) with the tergal lobes, *9t*, bifid, including a shorter, more conical lateral lobe or arm and a more slender blackened rod. Basistyle, *b*, with the mesal-apical lobe relatively short and stout. Outer dististyle, *od*, a simple slender elongate rod, narrowed to the acute tip. Inner dististyle, *id*, longer and much larger than the outer, widely expanded at apex and here more or less bilobed, one of the lobes covered with numerous acute spinulae.

*Hab.* Peru (Junin).

*Holotype*, ♂, Satipo, Jauja, altitude 800–900 metres, December 20, 1940 (*Paprzycki*).

The closest allies among the described species are *Helius* (*Helius*) *albogeniculatus* Alexander, *H.* (*H.*) *invariatus* Alexander, and *H.* (*H.*) *myersiellus* Alexander. These are entirely different from the present fly in the structure of the male hypopygium.

*Limnophila rubecula*, sp. n.

Belongs to the *undulata* group; size large (wing, male, 10 mm. or more); head light brown, the central portion of vertex grey; mesonotal præscutum with three reddish-brown stripes; scutal lobes and the scutellum patterned with dark brown; legs yellow or brownish yellow; wings with a deep yellow ground, abundantly patterned with pale brown; *Rs* long; *m-cu* at near mid-length of lower face of cell 1st  $M_2$ ; abdomen reddish brown, with a blackened median tergal stripe.

*Male*.—Length about 9 mm.; wing 10–10.8 mm.

Rostrum short, brown, sparsely pruinose; palpi black. Antennæ short; basal segments light brown, the outer flagellar segments passing into dark brown; basal flagellar segments short and crowded, the outer ones longer, with conspicuous erect setæ. Head light brown, the broad central portion of vertex light grey; anterior vertex broad; eyes relatively small.

Pronotum buffy, sparsely pruinose. Mesonotal præscutum with the restricted-ground-colour grey, with three more reddish-brown stripes, the median one entire; scutum reddish brown, each lobe with two dark brown areas, the more posterior one larger; scutellum similarly reddish brown with a somewhat darker spot on either



side at mid-length ; postnotal mediotergite clear light grey ; pleurotergite reddish brown. Pleura reddish brown, the dorsal and ventral mesepisternum and the metapleura darker. Halteres obscure yellow, the knobs weakly darkened. Legs with the coxæ slightly infuscated ; trochanters obscure yellow ; remainder of legs yellow or brownish yellow, the outer tarsal segments passing into dark brown. Wings with the ground-colour deep yellow, with an abundant reticulated pattern of pale brown, the major area at stigma and over the anterior cord slightly darker ; transverse streaks and dashes in the cells relatively abundant but ill-delimited, there being about eight in cell 2nd *A*, six or seven marginal lines in cell 1st *A*, and in similar proportions over the wing ; outer radial field with the areas fewer and more widely separated except for a grouping in outer end of cell *R*<sub>3</sub> ; veins yellow, darker in the patterned areas. Venation : *Rs* relatively long, approximately equal to the entire upper branch of *Rs* (combined *R*<sub>2+3</sub> and *R*<sub>3</sub>) ; *R*<sub>2+3</sub> longer than *R*<sub>1+2</sub> ; cell *M*<sub>1</sub> shorter than its petiole ; *m-cu* at near mid-length of lower face of cell 1st *M*<sub>2</sub>.

Abdomen reddish brown ; basal tergite darkened, the remainder with a more or less distinct median blackened stripe that is scarcely interrupted at the posterior border of the segments ; hypopygium obscure yellow.

*Hab.* Peru (Ayacucho).

*Holotype*, ♂, Yanamonte, La Mar, altitude 3000–4100 metres, in fog forests, September 25, 1941 (*Woytkowski*). *Paratopotypes*, 3♂♂, October 2–7, 1941 (*Woytkowski*).

The *undulata* group includes *Limnophila dictyoptera* Alexander, *L. guttulatissima* Alexander, *L. leucostigma* Alexander, *L. lloydi* Alexander, *L. madida* Alexander, *L. pullipes* Alexander, *L. schadei* Alexander, *L. subfuscata* Alexander, *L. undulata* (Bellardi), and others. The species that most resembles the present fly is the Mexican *madida*, which is distinguished by the coloration of the body, legs and wings, and by slight differences in venation.

*Limnophila procella*, sp. n.

Belongs to the *undulata* group ; general coloration of mesonotum grey, the præscutum with four slightly differentiated brownish-grey stripes ; basal flagellar segments produced on ventral face and without verticils at this

point; halteres pale yellow; fore coxæ darkened, their distal halves whitened; femora yellow, the tips blackened; wings pale yellow, reticulated with brown;  $R_s$  long, cell 1st  $M_2$  long; male hypopygium with the teeth of the outer dististyle relatively small and inconspicuous.

*Male*.—Length about 8–8.5 mm.; wing 8–9 mm.; antennæ about 1.3–1.5 mm.

*Female*.—Length about 9.5 mm.; wing 9.5–10 mm.

Rostrum grey; palpi black. Antennæ with scape dark brown, pruinose; pedicel light yellowish brown; first flagellar segment dark brown, pale basally; remaining segments uniformly blackened; proximal flagellar segments beyond the first enlarged and with the lower face produced, provided with a dense white pubescence but without verticils on this aspect; on about the sixth and succeeding segments with conspicuous verticils on both faces of segments. Head grey; posterior vertex on either side with conspicuous yellow setæ; anterior vertex wide, about five times the diameter of scape.

Pronotum grey, with a delicate median brown vitta. Mesonotum grey; præscutum with four slightly differentiated brownish-grey stripes, the lateral pair partially indistinct; scutal lobes each with two brown areas; scutellum darkened on either side; mediotergite grey in centre, darkened on sides and behind; pleurotergite uniformly grey. Pleura uniform grey, dorsopleural membrane chiefly darkened. Halteres uniformly pale yellow. Legs with the coxæ brownish black, grey pruinose, the fore pair with about the distal half abruptly whitened; fore trochanters yellow, darker on their posterior surface, other trochanters pale brown; femora yellow, the tips blackened, the amount subequal on all legs; tibiæ brownish yellow with blackened tips; tarsi passing into black. Wings with the ground-colour pale yellow, reticulated with brown, including larger areas at stigma and along the anterior cord, and again as a concentration in outer radial field; remaining cells of wing with a moderately heavy pattern that appears chiefly as transverse brown dashes, smaller and more punctiform in the more basal cells, the dark pattern including the wing tip; veins yellow, darker in the patterned areas. Venation:  $R_s$  long, weakly angulated at origin;  $R_{2+3+4}$  a little longer than the basal section of  $R_4$ ; cell 1st  $M_2$  long, with

*m-cu* more than one-half its length beyond the fork of *M*; cell *M*<sub>1</sub> shorter than its petiole.

Abdominal tergites dark brown, sparsely pruinose; basal sternites more reddish brown, especially on central portion; hypopygium dark brown. Male hypopygium with the apical teeth of outer dististyle relatively small and inconspicuous.

*Hab.* Peru (Ayacucho).

*Holotype*, ♂, Yanamonte, La Mar, altitude 3000–4100 metres, in fog forests, August 7, 1941 (*Woytkowski*). *Allotopotype*, ♀ August 3, 1941, pinned with two paratype ♂♂. *Paratopotypes*, 20 ♂♂, July 29–August 29, 1941 (*Woytkowski*).

The various species of the *undulata* group in Tropical America have been listed under the preceding species. The form most similar to the present fly is *Limnophila undulata* (Bellardi), which differs especially in the coloration of the body and wings.

*Shannonomyia sopora*, sp. n.

General coloration of thorax brownish yellow to obscure yellow, unpatterned; antennæ short, scape and pedicel brownish black, flagellum pale; head grey; halteres pale yellow; legs yellow, the outer tarsal segments brownish black; wings yellow, variegated only by the small, conspicuous, dark brown stigma; *R*<sub>2+3+4</sub> approximately twice the basal section of *R*<sub>5</sub>; *m-cu* at or beyond mid-length of cell 1st *M*<sub>2</sub>; abdomen, excepting the basal sternite, black; male hypopygium with the outer dististyle unequally bidentate at apex; gonopophysis a long, slender, gently curved spine with a microscopic tooth at near mid-length of the concave lower face.

*Male*.—Length about 5.2–5.5 mm.; wing 6–6.5 mm.; antenna about 0.7–0.8 mm.

*Female*.—Length about 6–7 mm.; wing 6.5–7.5 mm.

Rostrum dark brown, sparsely pruinose; palpi black. Antennæ short; scape and pedicel brownish black, flagellum obscure yellow to light brown, the outer segments more infuscated; flagellar segments long-oval, the verticils much exceeding the segments in length. Head grey, darker behind; a short dark line on the anterior vertex, the latter about twice the diameter of scape.

Pronotum brownish yellow, sparsely pruinose. Mesonotum uniformly brownish yellow to obscure yellow, unpatterned, not pruinose. Pleura yellow. Halteres uniform pale yellow. Legs yellow, the outer tarsal segments brownish black. Wings yellow, variegated only by the relatively small but very conspicuous dark brown stigma; veins yellow. Venation:  $R_s$  relatively long, subequal to or a little longer than cell 1st  $M_2$ ;  $R_{2+3+4}$  approximately twice the basal section of  $R_5$ ;  $m-cu$  at or beyond mid-length of cell 1st  $M_2$ .

Abdomen, including styli of hypopygium, black, the basal sternite usually obscure yellow; ninth segment, excluding the hypopygium, restrictedly obscure brownish yellow. Male hypopygium with the outer dististyle unequally bidentate at apex, the outer spine about twice as long as the triangular lower one; surface of style back from the blackened tip with abundant long coarse setae. Inner dististyle with the setae of basal two-thirds long and coarse, erect, becoming smaller outwardly; vestiture toward apex of style microscopic; apex of style terminating in two or three more conspicuous setae. Gonapophyses appearing as slender, gently curved spines, bearing a tiny denticle at near mid-length of the lower or concave surface. Aedeagus elongate, strongly convoluted on basal portion.

*Hab.* Peru (Junin).

*Holotype*, ♂, Huacapistana, Tarma, altitude 3600–5400 feet, February 4, 1940 (Woytkowski). *Allotopotype*, ♂, pinned with type. *Paratopotypes*, several ♂ ♀, February 4–March 24, 1940. *Paratypes*, ♂ ♀, Tulumayo Valley, Tarma, altitude 4000–8000 feet, October 1, 1940 (Woytkowski).

*Shannonomyia sopora* is most similar to *S. phæostigma* Alexander, which is readily distinguished by the uniformly grey coloration of the thorax and by details of structure of the male hypopygium.

*Atarba (Ischnothrix) obtusiloba*, sp. n.

General coloration of mesonotum dark brown, sparsely pruinose; antennae (male) relatively short; flagellar segments cylindrical, with unusually short and inconspicuous vestiture; knobs of halteres infuscated; legs dark brown, tibial spurs lacking; wings with a strong

brownish tinge;  $Sc_1$  ending about opposite one-fourth the length of  $Rs$ ; abdominal tergites brownish black, basal sternites more testaceous; basistyles bicoloured, pale, the apical third dark brown; ninth sternite produced into two powerful divergent spines; eighth sternite with a median obtuse lobe that is provided with a few strong setæ; outer dististyle with relatively few strong spines; dististyle broadly flattened.

*Male*.—Length about 5.5 mm.; wing 6 mm.; antennæ about 3.6 mm.

Rostrum obscure yellow; palpi black. Antennæ (male) relatively short, less than two-thirds the length of body; scape and pedicel brown, flagellum black; flagellar segments cylindrical, the more proximal ones long, the outer segments gradually decreasing in length to the end; verticils and pubescence unusually short and inconspicuous, subequal in length and either only a small fraction of the length of the segment. Head dark grey, more or less infuscated medially; anterior vertex broad, about three times the diameter of scape.

Pronotum and mesonotum chiefly dark brown, sparsely pruinose; humeral region of præscutum very restrictedly brightened; scutellum brownish testaceous. Pleura and pleurotergite obscure yellow. Halteres with stem yellow; knob infuscated. Legs with coxæ and trochanters obscure yellow; remainder of legs dark brown, the femoral bases restrictedly brightened; tibial spurs apparently lacking. Wings with a strong brownish tinge, the prearcular field a trifle brightened; stigma oval, slightly darker than the ground; veins brown, more brightened in the prearcular field. Macrotrichia of wing veins long and abundant. Venation:  $Sc_1$  ending about opposite one-fourth the length of  $Rs$ ,  $Sc_2$  almost opposite this origin;  $Rs$  angulated at near one-third the length; vein  $R_2$  oblique; cell 1st  $M_2$  rectangular, subequal in length to vein  $M_3$ ,  $m-cu$  at near the middle of its length.

Abdominal tergites brownish black, the basal sternites more testaceous; subterminal segments slightly deeper in colour; basistyles bicoloured, the proximal two-thirds pale, the apex conspicuously dark brown. Male hypopygium (fig. 8) with the ninth sternite,  $9s$ , produced into two powerful divergent spines that are slightly separated

at base. Eighth sterite, 8s, produced medially into an obtuse dusky lobe that is provided with a few normal setæ, not modified at apex as in *integriloba*. Basistyle, b, without a modified lobule on mesal face, as is common

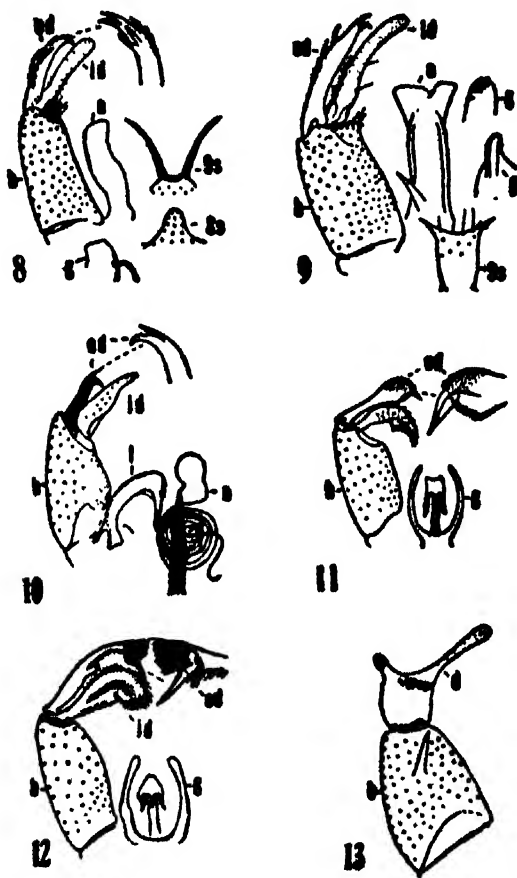


Fig. 8.—*Atarba (Ischnothrix) obtusiloba*, sp. n.; male hypopygium.

Fig. 9.—*Atarba (Atarba) scabrosa*, sp. n.; male hypopygium.

Fig. 10.—*Elephantomyia (Elephantomyia) tenuissima*, sp. n.; hypopygium.

Fig. 11.—*Erioptera (Erioptera) polydonta*, sp. n.; male hypopygium.

Fig. 12.—*Erioptera (Erioptera) polytricha* Alexander; male hypopygium.

Fig. 13.—*Toxorhina (Toxorhina) pergracilis*, sp. n.; male hypopygium.

(Symbols: a, aedeagus; b, basistyle; g, gonapophysis; id, inner dististyle; i, interbase; od, outer dististyle; s, sternite.)

in the genus. Outer dististyle, od, relatively slender, provided with only a few spines but these unusually strong. Inner dististyle, id, broadly flattened, a little longer than the outer style. Gonapophyses, g, appearing

as flattened plates, their tips narrowly truncate. *Ædeagus* sinuous, strongly flattened, the apex a little expanded.

*Hab.* Peru (Junin).

*Holotype*, ♂, Huacapistana, Tarma, altitude 3600–5400 feet, March 5, 1940 (*Woytkowski*).

*Atarba* (*Ischnothrix*) *obtusiloba* resembles species such as *A. (I.) geminata* Alexander and *A. (I.) integriloba* Alexander, differing from all in the greatly reduced vestiture of the antennæ and in the structure of the male hypopygium, notably the outer dististyle and the lobe of the eighth sternite.

*Atarba (Atarba) scabrosa*, sp. n.

General coloration of thorax reddish brown, unmarked, the pleura more brownish yellow; antennæ (male) about one-half the length of body; basal flagellar segments weakly bicoloured; legs yellow; wings greyish yellow, stigma very small, pale brown; *Rs* short; male hypopygium with the caudal margin of sternal plate produced laterad and slightly caudad into acute horns, the caudal margin very shallowly emarginate; outer dististyle with only a few strong teeth on outer margin; gonapophyses appearing as flattened blades, the margins of the obtuse tips roughened by microscopic papillæ or blunt denticles.

*Male*.—Length about 6.3–6.5 mm.; wing 7–7.3 mm.; antennæ about 3.1–3.3 mm.

Rostrum obscure yellow; palpi black. Antennæ (male) moderately long, approximately one-half the length of body; scape and pedicel yellow, basal flagellar segments weakly bicoloured, including narrow pale bases and even narrower tips to the segments, becoming obsolete on about the fifth; flagellar segments subcylindrical, each with an unusually long vertical, these unilaterally distributed, those on outer segments shorter; in addition to the verticils, segments provided with a dense pale pubescence. Head light brown, sparsely pruinose, especially behind; anterior vertex of moderate width, about one-half wider than the diameter of scape.

Pronotum light brown. Mesonotum reddish brown, unmarked; surface subnitidous, the postnotum sparsely pruinose. Pleura brownish yellow, sparsely pruinose. Halteres with stem yellow, knob weakly darkened.

Legs with coxae and trochanters yellow; remainder of legs yellow, the terminal tarsal segments blackened. Wings greyish yellow, the prearcular and costal regions pale yellow; stigma very small, pale brown, only a trifle darker than the ground; veins yellow. Venation: *Sc* short, *Sc*<sub>1</sub> ending some distance before the origin of the unusually short *Rs*, *Sc*<sub>2</sub> some distance from its tip, *Sc*<sub>1</sub> alone subequal to *Rs*; *Rs* from one-third to one-half longer than basal section of *R*<sub>5</sub>; cell 1st *M*<sub>2</sub> short-rectangular, *m-cu* at near one-third its length.

Abdominal tergites obscure brownish yellow medially, darker brown on sides and less distinctly so on caudal margins; sternites obscure yellow; subterminal three segments more uniform dark brown or brownish black to form a broad ring; hypopygium light yellow. Male hypopygium (fig. 9) with the outer angles of sternal plate, *9s*, produced laterad and slightly caudad into acute horns, the caudal margin between the horns very shallowly emarginate. Basistyle, *b*, with lobe of mesal face unusually large and conspicuous. Outer dististyle, *od*, slender, the outer margin with three strong teeth, in addition to the short curved apical spine; proximad of the basal spine with two or three additional smaller spinules or points. Inner dististyle, *id*, relatively slender, darkened. Aedeagus, *a*, relatively short, stout, at apex flaring and expanded. Gonapophyses, *g*, appearing as flattened blades, their tips obtuse, the apical margin roughened by microscopic papillæ or blunt denticles.

*Hab.* Peru (Junin).

*Holotype*, ♂, Huacapistana, Tarma, altitude 3600-5400 feet, March 10, 1940 (*Woytkowski*). *Paratopotype*, 1 ♂, February 15, 1940.

*Atarba* (*Atarba*) *scabrosa* is best distinguished from all other similar species by the structure of the male hypopygium, especially of the gonapophyses. These latter organs show a considerable range of structure among the various species of the subgenus. Several have the margins of these organs toothed or spined in various ways, these including *A. (A.) boliviiana* Alexander, *A. (A.) idonea* Alexander, *A. (A.) multiarmata* Alexander, *A. (A.) nodulosa* Alexander, *A. (A.) punctiscuta* Alexander, *(A.) A. scutata* Alexander, and *A. (A.) tatei* Alexander. Others have the margins of the gonapophyses entirely



smooth. The present fly differs from all of the numerous members of the genus by the papillose nature of this armature. The species most similar in this latter regard is *A. (A.) brevicornis* Alexander, but in all other respects the two flies are entirely distinct.

*Elephantomyia (Elephantomyia) tenuissima*, sp. n.

General coloration of thorax pale yellow, unmarked; legs obscure yellow to brownish yellow; no tibial spurs; wings yellowish subhyaline, the small stigma pale brown; *Rs* arcuated to weakly angulated near origin; male hypopygium with the outer dististyle unequally bidentate at apex; interbasal rods appearing as large, flattened blades, their tips bent at a right angle, the apical margin at the bend with a curved row of microscopic spines; penefilum very long and delicate, appearing as a coil more or less suggesting a watch-spring.

*Male*.—Length, excluding rostrum, 6.7 mm.; wing 6.7 mm.; rostrum alone 4–5 mm.

*Female*.—Length, excluding rostrum, 6.5–9 mm.; wing 6–7 mm.; rostrum alone 4.2–5.2 mm.

Rostrum and palpi black. Antennæ with scape yellow to pale brown; pedicel light brown; flagellum black; flagellar segments cylindrical, the outer segments more elongate, with unusually long verticils, especially on the intermediate segments. Head yellow, the front and orbits more whitened; eyes large, reducing the anterior vertex to about two-thirds the diameter of scape, subequal or even narrower in the female.

Thorax uniform light yellow. Halteres with stem pale, knob weakly infuscated. Legs with coxæ and trochanters yellow; remainder of legs more obscure yellow to brownish yellow, the terminal tarsal segments scarcely darker; tibial spurs lacking; claws (male) simple. Wings yellowish subhyaline, even clearer yellow in the prearcular and costal fields; stigma relatively small, oval, pale brown; veins brownish yellow, clearer yellow in the brightened portions. Venation: *Rs* moderately long, arcuated to weakly angulated near origin; cell 1st *M*<sub>2</sub> rectangular, subequal to or a trifle longer than vein *M*<sub>3</sub>; *m-cu* from one-third to fully its own length beyond the fork of *M*.

Abdomen obscure brownish yellow, the sternites clearer yellow; in male, subterminal two segments weakly darkened to produce an inconspicuous subterminal ring; hypopygium yellow. Male hypopygium (fig. 10) with the outer dististyle, *od*, relatively stout, unequally bidentate at tip, the axial spine longer. Inner dististyle, *id*, longer than the outer style. Interbasal rods, *i*, strong, appearing as large flattened blades, at apex dilated and bent at a right angle into a long pale point, the apex of the deflected portion with several small marginal denticles; lower margin of rod, near the deflected portion, paling into transparent membrane, its limits difficult to decipher. *Ædeagus*, *a*, produced into an extremely long coiled penefilum, this appearing as a very delicate hair-like structure, its total length probably fully equal to or longer than the length of the abdomen.

*Hab.* Peru (Junin, Ayacucho).

*Holotype*, ♂, Satipo, Jauja, Junin, altitude 800-900 metres, August 19, 1939 (*Paprzycki*). *Allotype*, ♀, Tulumayo Valley, Tarma, Junin, altitude 4000-8000 feet, November 1, 1940 (*Woytkowski*). *Paratypes*, 3 ♂♀, with the allotype, November 6-10, 1940; 2 ♂♀, Ayna, La Mar, Ayacucho, altitude 2400 metres, May 18-31, 1941 (*Woytkowski*).

*Elephantomyia* (*Elephantomyia*) *tenuissima* is readily told from the related regional species by the structure of the male hypopygium, especially the interbase and penefilum. This latter is more elongate and coiled than in any other American species known to me.

*Trentepohlia* (*Paramongoma*) *disparilis*, sp. n.

Belongs to the *bromeliadicola* group; size large (wing, male, over 9 mm.); general coloration of mesonotum dark brown, the posterior sclerites more pruinose; femora obscure yellow, with a broad black subterminal ring, the tips abruptly white; tibiae and tarsi snowy white; wings brownish yellow, unpatterned except for a small pale brown stigma; cell 1st  $M_2$  long, subequal in length to vein  $M_3$  beyond it; basal abdominal tergites light brown, the sternites yellow; outer segments blackened.

*Male*.—Length about 11 mm.; wing 9.2 mm.

Rostrum yellow; palpi pale basally, the terminal segment brownish black. Antennæ with scape yellow at base, the apex infuscated; pedicel pale brown, flagellum

black; flagellar segments becoming more elongate and slender outwardly. Head above buffy; anterior vertex reduced to a narrow greyish strip, at its narrowest point only about as wide as a single ommatidium.

Pronotum pale brown; pretergites more whitened. Mesonotum almost uniformly dark brown, the lateral and humeral portions somewhat paler; scutellum and postnotum more pruinose. Pleura obscure yellow, the dorso-pleural region a trifle more infuscated. Halteres dusky. Legs with coxæ yellow, the fore pair a trifle darker; trochanters obscure yellow; femora obscure yellow, becoming darker outwardly, forming a broad black subterminal ring, the tip abruptly white; pattern approximately alike on all legs; black ring more than three times the extent of the white tip; tibiæ and tarsi snowy white, the outer tarsal segments a trifle infuscated. Wings brownish yellow, unpatterned except for a small oval pale brown stigma; prearcular and costal fields a little clearer yellow; veins brown. Venation.  $R_2$  about one-third longer than  $R_{3+4}$ ;  $R_{2+3+4}$  not sinuous, cell 1st  $M_2$  long, subequal in length to vein  $M_3$  beyond it,  $M_{3+4}$  about one-half longer than  $M_4$ ,  $m-cu$  from one-third to two-fifths its length before the fork of  $M$ ; cell  $cu$  widely open at margin, the distance only a little less than  $m-cu$ .

Basal abdominal tergites light brown, the caudal borders of the segments very narrowly pale; outer segments more uniformly blackened; basal sternites light yellow, the outer segments, including hypopygium, blackened.

*Hab.* Peru (Junin).

*Holotype*, ♂, Satipo, Jauja, altitude 800–900 metres, July 16, 1940 (Paprzycki).

*Trentepohlia* (*Paramongoma*) *disparilis* is entirely different from the numerous other species of the subgenus now known from Tropical America. By my latest key to the members of the *bromeliadicola* group (Journ. N.Y. Ent. Soc. xxvii, p. 142; 1919), the fly runs with difficulty to *T. (P.) leucozena* (Alexander), of Mexico, which is entirely different in the coloration of the body, legs and wings.

*Erioptera* (*Erioptera*) *polydonta*, sp. n.

Allied to *multiannulata*; head white; thoracic pleura conspicuously striped with brownish black and white; halteres white throughout; legs banded with black and

white; wings unpatterned; cell  $M_2$  open by atrophy of  $m$ ; male hypopygium with the outer dististyle terminating in an acute spine, the apex with a comb of microscopic teeth.

*Male*. —Length about 2.3 mm.; wing 2.5 mm.

Rostrum and palpi black. Antennæ dark brown, the flagellum somewhat paler; outer flagellar segments becoming elongate-cylindrical, with long conspicuous verticils. Head white; vertex broad.

Pronotum white, restrictedly infuscated behind, provided with a few conspicuous setæ; pretergites restrictedly whitened. Mesonotum medium brown, the præscutum without clearly defined stripes. Pleura conspicuously striped longitudinally with brownish black and white, the latter colour including the dorsopleural region and a ventral stripe extending from behind the fore coxæ, passing beneath the root of the halteres to the abdomen. Halteres white throughout. Legs with coxæ and trochanters infuscated; femora white, ringed with black, the most distinct dark bands being two on distal half of segment, separated by narrow white rings, the actual femoral tip white; tibiæ brown to brownish black, the base and tip abruptly snowy white; where the central portion of tibia is brown, this colour deepens to black where it adjoins the white apices; basitarsus with a blackened ring at base and beyond mid-length, the intermediate portion brownish yellow, the apex white; second tarsal segment darkened at base, dull white at apex; remaining tarsal segments pale brown; legs densely clothed with elongate flattened scales. Wings with a strong brownish tinge, the prearcular and costal fields more yellowish brown; veins and trichia slightly darker brown. Venation:  $Sc_1$  ending about opposite fork of  $R_{2+3+4}$ , the latter about one-third longer than the basal section of  $R_3$ ; cell  $M_2$  open by atrophy of  $m$ ;  $m$  *cu* erect, at the fork of  $M$ ; vein 2nd  $A$  only gently sinuous.

Abdominal tergites brownish black, the basal sternites a little paler; hypopygium dark. Male hypopygium (fig. 11) with the outer dististyle, *od*, terminating in an acute spine, the apex before this point with numerous microscopic teeth forming an irregular comb. Inner dististyle only moderately expanded. Gonapophyses, *g*, appearing as slender pale blades, the tips subacute.

*Hab.* Peru (Jurin).

*Holotype*, ♂, Satio, Janja, altitude 800–900 metres, February 15, 1941 (*Paprzycki*).

*Erioptera* (*Erioptera*) *polydonta* is quite distinct from the other species of the *multiannulata* group; differing especially in the structure of the male hypopygium, particularly the outer dististyle. The most similar species is *E. (E.) polytricha* Alexander, whose hypopygium is shown for comparison (fig. 12).

*Toxorhina* (*Toxorhina*) *pergracilis*, sp. n.

General coloration of mesonotum reddish brown, paling to greyish white on sides; femora and tibiæ obscure yellow, their tips undarkened; wings with a strong brownish yellow tinge, the veins deeper yellow, not contrasting conspicuously with the ground; abdomen with basal and intermediate segments bicoloured, obscure yellow, the incisures dark brown, a uniformly dark subterminal ring; male hypopygium with the basistyle armed with a straight, acutely pointed spine; blade of dististyle unusually long and slender, the margins smooth.

*Male*.—Length, excluding rostrum, about 6–6.5 mm.; wing 5.5–6 mm.; rostrum 5.5–5.6 mm.

*Female*. Length, excluding rostrum, about 8 mm.; wing 7 mm.; rostrum 6–6.2 mm.

Rostrum dark brown, nearly as long as wing. Antennæ brownish black throughout. Head light yellowish grey; anterior vertex parallel-sided, relatively wide, approximately twice the diameter of scape.

Pronotum brownish black. Mesonotal præscutum chiefly covered by three light brown to reddish-brown stripes, the interspaces feebly differentiated, the humeral and very wide lateral borders paling to greyish white; scutal lobes darkened; scutellum dark, sparsely pruinose, with an obscure yellow border; postnotum grey pruinose. Pleura obscure yellow, with a conspicuous dark brown dorsal stripe extending from the pronotum to the pleurotergite. Halteres relatively short, dirty white. Legs with the coxæ and trochanters yellow; femora and tibiæ obscure yellow, the colour more or less obscured by dark setæ; tips of tibiæ not darkened; tarsi passing into dark brown. Wings with a strong brownish-yellow tinge, the prearcular and costal fields clearer yellow; veins deeper yellow, not contrasting conspicuously with the ground. Venation: *r-m* before mid-length of cell 1st *M*<sub>2</sub>; *m-cu* at

fork of  $M$ ; cell 1st  $M_2$  longer than any of the veins issuing from it; vein  $R_5$  unusually deflexed, terminating at or just beyond the wing-apex.

Abdomen conspicuously bicoloured, obscure yellow, the incisures dark brown, including the narrow bases and broader tips of the individual segments; subterminal segments uniformly darkened to form a ring; hypopygium and preceding segment yellow. Male hypopygium (fig. 13) with the basistyle,  $b$ , armed with a spine on distal half, this smooth and nearly straight, narrowed to an acute point. Dististyle,  $d$ , with the outer darkened tubercle slender; rostral blade unusually long and slender, its margins smooth; distal blade about twice as wide as the narrowest part of stem; at base of rostrum with a group of about twenty strong setæ; spatula with other setæ of various lengths, including two longer ones. Apices of the paired lobes of the ædeagus of moderate length.

*Hab.* Peru (Ayacucho).

*Holotype*, ♂, Ayna, La Mar, altitude 2400 metres, April 27, 1941 (Woytkowski). *Allotopotype*, ♀, pinned with type.

In its general appearance, *Toxorhina* (*Toxorhina*) *pergracilis* is most similar to species such as *T. (T.) centralis* Alexander and *T. (T.) meridionalis* Alexander, differing most evidently in the structure of the male hypopygium, as the presence of a spine on the basistyle, and the structure of the dististyle. The present fly has vein  $R_5$  unusually decurved and the blade of the dististyle very long and slender, whence the specific name.

#### XVIII.—*The Leeches (Hirudinea) of Lake Huleh, Palestine.*

By J. PERCY MOORE.

THE collection herein reported upon was made by Mr. Roger Washbourn and associates during a biological survey of the lake on the Percy Sladen Expedition of 1936\* and was submitted to me for determination through the kindness of Mr. C. C. A. Monro, of the British Museum. Accounts of the purposes and results of the expedition and of the physical and biological characteristics of the

\* See "Report of the Percy Sladen Expedition to Lake Huleh; a Contribution to the Study of the Fresh Waters of Palestine." By Roger Washbourn and R. F. Jones, *Ann. & Mag. Nat. Hist.* (11) ii. pp. 517-560 (1938).

lake and its surroundings will be found in the two articles in 'Nature' listed in the bibliography. There also are included references to the few previous reports on the leeches of Palestine and Syria. The most important of these in the present connection is Annandale's account of the leeches of the neighbouring Lake Tiberias.

As would be expected, the leech fauna is a meagre one, but undoubtedly other species, especially those parasitic on fishes and frogs and mud-inhabiting species, remain to be discovered. The collection includes five well-defined species of four genera. Of these three are new to Palestine—the true holarctic *Theromyzon tessulatum* and the North African *Batrachobdella algira* and *B. nilotica*. All of these, as well as the three or four species previously recorded, may be regarded as belonging to the circum-Mediterranean fauna. For additional synonymy see references cited and for the Glossiphonidae Autrum, 1936.

The only additional species hitherto recorded from Lake Huleh is *Helobdella stagnalis* (Linn.) under the name of *Glossiphonia bioculata* (Bergmann) by Blanchard (1893a). In addition the following have been reported from other parts of Palestine: *Placobdella carinata* (Diesing), Blanchard, 1893a (regarded by Autrum as a synonym of *P. costata* and therefore probably not an addition), *Hirudo medicinalis* Linn., Blanchard, 1893a and b, *Limnatis nilotica* (Savigny), Blanchard, 1893a and b, Annandale, 1913; Harding, 1908; and *Hæmopsis sanguisuga* (Bergmann), Blanchard, 1893b and Annandale, 1913. Under the name of *Dina Blaisei* Blanchard, 1893a, b, reports *D. lineata* as excessively abundant. This gives ten species as actually known from the general region of Syria, Lebanon and Palestine. They all belong to the circum-Mediterranean Palearctic fauna of southern Europe, North Africa and South-west Asia.

## GLOSSIPHONIDÆ.

### BATRACHOBDELLA ALGIRA (Moquin-Tandon).

*Glossiphonia algira* Moquin-Tandon, 1846.

*Batrachobdella latactis* Viguier, 1879.

*Batrachobdella algira* Eoq.-Tan.), Johannson, 1926.

A single well-preserved specimen measures  $12 \times 3$  mm. in moderate extension. General outline ovate-lanceolate

with the head slightly widened and the caudal peduncle well defined and slender. The sucker is very shallow, saucer-like and rather large, exceeding one-half the maximum width of the body. The positions of the mouth, the single pair of eyes and the gonopores ( $\sigma$  XI/XII,  $\varphi$  XII *a* 2/*a* 3) agree with the description of Blanchard, 1893*c* *et al.* Reducing Blanchard's system of notation to mine the annulation conforms except that somite V is triannulate dorsally and biannulate ventrally instead of biannulate all around, as Blanchard's figure would seem to indicate. Sensillæ, especially the dorsal intermediates, are conspicuous and a series of small conical papillæ in the median line of all annuli is visible under slight magnification ( $\times$ ) from IX to XXV.

The preserved specimen is opaque even in clearing media, due to the great number of closely placed dark brown chromatophores which are arranged on the dorsum in upwards of 40 deeper lines between the longitudinal muscle bands, and 14-16 coarser, more superficial, longitudinal lines. The general colour is olive-brown. Behind the eyes is an irregular brown spot and laterad of each of the intermediate sensillæ on somites X to XXIII, at least, is a rather conspicuous sub-quadrate dark brown spot. On the cephalic and caudal suckers the deep chromatophores are arranged similarly, but the former is paler and the latter exhibits a superimposed radial pattern. Ventral colour similar but paler and more uniform. The colour of the preserved specimen, therefore, differs but little from the living as figured by Moquin-Tandon (1846) and Kowalevsky (1900*a*).

The diffuse salivary glands extend from VIII to the genital region, where their exact limit cannot be seen. Gastric cæca seven pairs, arising in XIII to XIX, those of the first pair small but extending cephalad somewhat into the genital region; the next five pairs are simply bifurcate at the ends and the seventh is reflexed to XXIV with bifid lateral branches in each somite. The latter and the four pairs of intestinal cæca are correctly figured by Kowalevsky (1900*a*) but not by Viguier (1880), by whom they were apparently confused. There are six pairs of testes, and the remaining organs of reproduction appear to agree with Viguier's figures, although the opacity of the region renders them obscure.

The single example (No. 1104) was taken with one



*Dina* on stones at Yesud Bay, August 25. The word "common" on the label probably refers to the *Dina*.

# BATRACHOBDELLA NILOTICA (Johannson).

*Clepsine nilotica* Johannson, 1909.

*Batrachobdella nilotica* (Johannson), Autrum, 1936

In a recent paper (Proc. Acad. Nat. Sci. Phila. 1938) I published the conclusion that this species is synonymous with *Helobdella tricarinata* Blanchard (1897). This opinion was based upon the study of twenty specimens from east African lakes which when first examined had been divided into two lots, one of which obviously had two pairs of eyes, the other apparently only one pair. When final studies were made of whole cleared mounts, sections and dissections, it was found that all possessed two pairs of eyes and six pairs of testicular sacs. It was therefore concluded that Blanchard's types were deficient in respect to the small eyes and Johannson's with respect to the posterior testes or that these authors respectively had overlooked these organs.

The present collection includes four specimens which agree with *B. nilotica* in all studied characters, both external and internal. Three of these were stained and mounted, the fourth, which bears a large number of young inclosed in the inrolled margins of the body, proving unsuitable for mounting. Two very clearly have four pairs of testes with a doubtful fifth on the right side of one; the third shows less clearly, but none can be seen after the fourth at *XVI/XVII*. For this reason the question of the distinctness of this species is again opened, on the ground especially of reduction in the number of pairs of testes sacs below normal. I therefore, with some reservations, revert to my position of 1933.

Measurements range from  $8 \times 1.6$  to  $10.3 \times 1.6$  mm. for two extended specimens, and  $7 \times 2.2$  mm. to a slightly greater length and much greater width (for the brooding specimen which could not be satisfactorily measured) for two more contracted examples. On the extended specimens the mouth is very clearly in the middle of the cephalic disk, the eyes on *III*, and the gonopores at *XI/XII* and *XII a 2/a 3*. Also on these the head is distinctly widened, but on the contracted ones much less so and more triangular. Annulation agrees closely with

that of *B. algira*, but the papillæ though small are much more distinct than on No. 1104 and are more numerous, there being, besides the five regular series, a number of smaller ones between them. On two of the specimens there are clearly three preocular annuli, representing the prostomium and somites I and II. Sensillæ conspicuous, and on one specimen they can be traced as far forward as III. Colour to the naked eye appears to be a nearly uniform pale greenish grey which under magnification proves to be due to alternating brown and green lines as in *B. algira*. There are also dark spots flanking the dorsal sensillæ, a dark spot behind the eyes and a dark centre to the dorsal face of the caudal sucker from which extend brown rays alternating with four pairs of very conspicuous whitish papillæ bearing sensillæ.

The straight retracted proboscis reaches from VI to XI or XII. The exact limits of the diffuse salivary glands is obscured, but they appear to extend from at least IX to XIII. On one specimen the œsophageal glands forming a belt round the œsophagus in XI and XII are very conspicuous and partly cover and conceal the reproductive organs from above. Gastric cæca seven pairs, and they and the four pairs of intestinal cæca are disposed as in *B. algira*. Except for the reduced number of testes the reproductive organs exhibit only slight differences from those of *B. algira*, and probably these differences are not constant. On two examples the ovisacs reach to XIII or XIV, the right being slightly longer in both.

No. 1417, North Jordan, from *Polygonum*, one with two *Placobdella costata*; No. 2110, mud at edge of swamp, August 28, one bearing many embryos closely enwrapped, in the extended margings of the body and another which had recently born young; No. 3107, Foulonire, on lily stems, one.

#### THEROMYZON TESSULATUM (O. F. Müller).

*Hirudo tessulata* O. F. Müller, 1774.

*Theromyzon pallens* Philippi, 1867.

*Glossiphonia tessellata* (O. F. M.), Blanchard, 1893.

*Protopcleps tessellata* Livanow, 1902.

*Theromyzon tessulatum* (O. F. M.) Autrum, 1936.

This widely distributed species has not been recorded previously from Palestine, but one was taken by Dr. Festa in Lebanon as reported by Blanchard, 1893-b.

Washbourn's collection includes a single small contracted specimen measuring  $7 \times 2.3$ , caudal sucker 1.5 mm. While a detailed study was not made, all of the external characteristics diagnostic of the species were observed. The four pairs of eyes show very clearly the typical arrangement, the gonopores are separated by four annuli and the annulation, while in places obscure, certainly agrees in all essentials; there is at least one preocular annulus (prostomium). General colour pale golden greenish very thickly dotted in all parts with minute dark brown pigment cells arranged irregularly in both transverse and longitudinal lines, the latter most distinctly in the median field of the preclitellar region. The yellow spots have disappeared.

No. 4027, north end of lake, December 3, "among remains of water lily zone," one with a small *Dina lineata*.

#### PLACOBDELLA COSTATA (F. Müller).

*Clepsine costata* F. Müller, 1846.

*Haementeria costata* Kowalevsky, 1899, 1900.

*Placobdella catenigera* (Moq.-Tan.) Annandale, 1913.

*Haementeria (Placobdella) costata* (F. Müller) Autrum, 1936

This species has been recorded in all accounts of the leeches of Palestine, Lebanon and Syria, including Lake Tiberias (Annandale, 1913, 1916) and Lake Phiala (Blanchard 1893 *a*, *b*), but not previously from Lake Huleh, where it is evidently very common and associated with the next.

Many of the specimens retain much of the colour pattern, which agrees closely with Kowalevsky's (1900 *b*) beautiful figures. They closely resemble *P. rugosa* (Verrill) and like that species may be very rough or relatively smooth, according to the degree of extension or contraction of the papillæ. None of the specimens shows the degree of excessive flattening of which *P. rugosa* is capable, nor was the lack of alignment of dorsal and central furrows characteristic of the latter observed. The arrangement of the papillæ also presents some differences. No sections have yet been completed for study especially of the eyes. When cleared and examined under pressure the very dense black pigment cups are seen to be united medially by an equally dense black pigment mass which looks as though it might contain a pair of smaller eyes as shown in some of Kowalevsky's figures (1900).

Specimens in the collection are numbered 1079, 1416, 1417, 1420, 2156, 2185, 2201 and 2203, taken, so far as recorded, from September 23 to November 19. They were found mostly in swamps on various plants such as water lilies, papyrus, *Polygonum* or in mud about plant roots, often with *Dina lineata* or in one case with *Batrachobdella nilotica*. The size varies from about  $15 \times 3.5$  to  $23 \times 7$  mm. and none was brooding.

### ERPOBELLIDÆ.

*DINA LINEATA* (O. F. Müller) subsp. *concolor* Annandale.

*Hirudo lineata* O. F. Müller, 1774.

*Dina Blaisei* Blanchard, 1892, 1893 c.

*Herpobdella* (D.) *lineata* (O. F. M.) subsp. *concolor* Annandale, 1913.

*Dina lineata* (O. F. Müller) Johansson, 1914.

As reported by all students of leeches of the region, this is the one really abundant species throughout the Jordan Valley and Syria. Annandale reports that his subspecies is one of the commonest animals in Lake Tiberias and that it occurs in surrounding swamps and springs. It is equally abundant in Lake Huleh, occurring under similar conditions apparently in all parts of the lake, in the Jordan River and neighbouring swamps and springs in association with all of the other species herein reported except *Batrachobdella nilotica*, but also in many lots with no other species. As reported on the labels, most of them were taken under stones along shore, but a few on plants or in mud, the dates recorded on the labels extending from August 23 to December 3. The lot numbers are 1101, 1101 (2), 1104, 1206, 1416, 1505, 2201, 2203, 4002 and 4027.

Most of the specimens are of small size, under 20 mm. long in normal extension and all are immature; several are excessively extended, one measuring  $40 \times 1$  mm. The largest measures  $35 \times 3$  mm. With few exceptions all have two pairs of labial and two pairs of buccal eyes, but a few cases of eye deficiency were noted, the most important being No. 4027, which has only one pair of labials. All external characters conform to the species and the colour to Annandale's description of his subspecies. Some of these are very finely speckled with minute black pigment cells, usually on the dorsum of

the preclitellar region. Several local colour forms of this species have been described by Johansson and others. Whether they and *concolor* prove to be true subspecies remains to be determined, as in most other cases among leeches.

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XIX.—*Pediculopsis graminum* E. Reuter, 1900: *A Species of Tarsonemidæ new to Britain*. By A. M. MASSEE, D.Sc. (Research Station, East Malling, Kent).

IN June 1943, Mr. E. D. Wiggins, of the Department of Plant Pathology, Seale-Hayne Agricultural College, Newton Abbott, Devon, submitted to East Malling some very interesting mite material which he had collected in Devonshire in the summer of 1941.

The mites were discovered infesting oats in a field at Court Barton, Thurlestone, Devon, in July 1941. A closer examination of the infested oat-shoots revealed gravid female mites containing egg-masses and larval stages of the mite in considerable numbers in the stems of the plants. A second infestation was noted at Wadde-ton, near Brixham, Devon, about a week later.

A detailed examination of the mite shows that it is contained in the family Tarsonemidæ and that it belongs to the genus *Pediculopsis*, the scientific name of the species being *Pediculopsis graminum* E. Reuter, 1900. This is the first record of this species in Great Britain. The only other European species contained in the same genus is *Pediculopsis ventricosus* Newport, which is associated with various species of insects and other animals, including human beings (Hirst, 1920).

*Pediculopsis graminum* E. Reuter, is well known on the Continent of Europe, and has been recorded from at least six countries, including Finland, Sweden, Denmark, Germany, Switzerland and Russia. It has been found also in the United States of America, where it has been recorded from Illinois, Nebraska and Virginia. In America it is associated with the carnation bud-rot, (*Sporotrichum poæ*) (Banks, 1915). The rot is primarily due to a fungus, but the mite is an active agent in spreading the spores (Sorauer, 1925).

The mite is known also by the scientific name of *Pediculoides graminum* E. Reuter.

The mite is regarded as an economic species in several European countries, where it has been recorded infesting no less than thirty species of meadow grasses. It also infests cereals, causing considerable injury to wheat, oats, barley and rye. The infested meadow grasses and cereals may be considerably malformed and stunted. Their natural colour is lost and the plants assume a silvery appearance. This condition of the plant has been described very aptly as "silver top" (Reuter, 1909).

*Pediculopsis graminum* E. Reuter is contained in the subfamily Pediculoidinæ, which is separated from the Tarsoneminæ by the fact that the hind legs of the female end in a claw and sucker disc; in the male the hind legs are shorter than the third pair. In the Tarsoneminæ the hind legs of the female end in long hairs; in the male the hind legs are about the same length as the third pair.

The life-cycle of *P. graminum* is very remarkable and differs considerably from those mites contained in the closely allied genus *Tarsonemus*. For example, the abdomen of the gravid female becomes much swollen, one hundred to one hundred and fifty times its normal size, and large numbers of eggs and the larval forms occur within this inflated sack. The male is insignificant compared to the female. The hind legs are shorter than the third pair, and there are no mouth-parts.

The original description of the mite (Reuter, 1900) is very complete, and the distinguishing characters so well defined that it is proposed to include a detailed translation of Reuter's descriptions of the adult stages for the benefit of students of the group.

#### *Description.*

"Body broad oval (male) or oblong (female), depressed, with several strong pairs of bristles, the last pair of bristles of the cephalothorax very long. Colour amber-yellow.

"♂.—Body broadly egg-shaped, compressed, portion behind reproductive organ blunt, then drawn out conically. Rostrum very small, deformed into a round knob-shaped structure, without any mouth-parts. Cephalothorax somewhat round, shaped like a trapeze, with four pairs of bristles, of which the first pair is very small and almost

central, the second pair a little longer, and the third pair about twice as long as the second; the first three pairs of bristles are situated in a straight line approximately parallel to the lateral margin of the cephalothorax; the fourth pair is situated just below the third, very long. Hind part of abdomen tapering, then becoming depressed, and raised again at the genital organ, with a longer lateral and three fairly long dorsal pairs of bristles, the first, which is the longest, is situated nearest the cephalothorax, the second in the arched cavity and the third at the base of the reproductive organ. The first pair of legs terminates in a narrow curved and pointed claw, with the longest bristles on the second, fourth and fifth segments; the two central pairs of legs, each with two curved claws and a bell-shaped suction disc, are situated between them, each ornamented with a pointed spine. The hind pair of legs, somewhat shorter and thicker than the rest, slightly curved inwards, terminates in a strong sickle-shaped curved claw; longest bristles on last segment. The front and hind epimeron strongly chitinized, ornamented with bristles arranged in pairs. The reproductive organ of the mite ornamented both at the central portion of the lower side and the ends with two pairs of small bristles.

" Length 130  $\mu$ , breadth 75  $\mu$ .

" ♀. —Non-gravid. Body drawn out, egg-shaped, with the hind end truncated. Rostrum fairly large, tapering, with strong claw-shaped, externally somewhat round, internally somewhat dented, pointed mandibles. Dorsum of cephalothorax subtriangular, rounded in the front, the sides emarginate, with three pairs of bristles; the first pair is the smallest, about the length of the third segment of the leg, the central bristle nearly twice as long as the first, and the first two pairs being situated nearer to the lateral margin than the third pair. The latter is situated in the centre of the cephalothorax, approximately in line with the first pair, very long, about the length of the abdomen. Clavate organ broad, rounded, egg-shaped. Abdomen broadest nearest the cephalothorax; the transverse markings of the integuments of the mite give the animal the appearance of being segmented; the abdomen bears several fairly strong pairs of bristles, one pair of lateral bristles situated just below the cephalothorax, and, in



addition, four pairs of dorsal bristles in a line, the third pair being the longest ; also there are two pairs of bristles at the anal end, the external and upper bristle being stronger than the rest.

“ There are two oblique short, slightly curved, engraved markings on the dorsum of the abdomen situated in between the first and second pairs of dorsal bristles. Legs five-segmented and strongly bristled, the strongest situated on the second, fourth and fifth segments. The first three pairs of legs are similar to the corresponding legs of the male, the fourth pair more slender and with fewer bristles than the rest and, similarly to the two central ones, terminate in two claws and a suction disc. The epimeron bristled similar to the male, the front ones with fairly strongly chitinated carinæ.

“ Length 220–270  $\mu$  ; breadth 90–95  $\mu$ .

“ ♀.—Gravid. Differs from the non-gravid female by the form of the abdomen ; the whole of the body from the front margin of the cephalothorax becomes more or less, but generally greatly, enlarged into a bladder-like inflated sack, which may be oval or elliptical. The enormous inflation of the abdomen, which may be several times the size of the body of the non-gravid female, is made possible by the unfolding of the integument, and also by the expanding of the integument, which is elastic, and, when expanded, becomes transparent. The abdomen of the gravid female contains eggs or embryos, in different stages of development up to the larval stage, in varying numbers from a few up to one hundred or a hundred and fifty, or even more.

“ Length up to 1900  $\mu$  (=cephalothorax 75  $\mu$  + abdomen 1825  $\mu$ ) ; breadth of the abdomen up to 750  $\mu$  ; depth of abdomen up to 500  $\mu$ .

“ Egg, before embryonic development, elliptical, 150  $\mu$  long, 100  $\mu$  in diameter.”

The writer is greatly indebted to Mr. E. D. Wiggins for bringing this interesting mite to his notice, and for help in many other ways ; and to Dr. V. H. Goldschmidt, of the Imperial Bureau of Horticulture and Plantation Crops, East Malling, for help in translating the description of mites.

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XX.—*The Asiatic Beetles of the Melolonthine genus Schizonycha.* By GILBERT J. ARROW, F.Z.S., F.R.E.S., British Museum (Natural History).

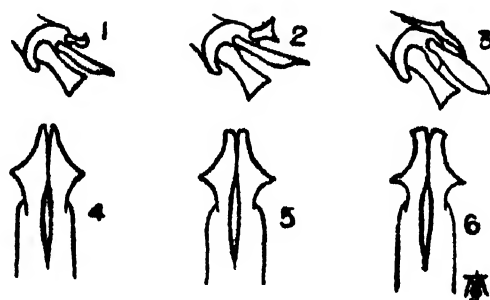
THE genus *Schizonycha* forms one of the most conspicuous elements in the African beetle fauna, no fewer than 300 African species having been described, including a single one, *S. algerica* Fairm., in the Mediterranean region, but non-African species are very few. Of ten names in the 'Junk Catalogue' by Dalla Torre of supposed Asiatic representatives, four Chinese insects assigned to the genus by Fairmaire (*mucorea*, *obscurata*, *pexicollis* and *tenebrosa* Fairm.) belong to other genera, the first three probably to *Holotrichia*; *S. bomuana* Brsk. is an African species wrongly attributed by the catalogue to Borneo, *singhalensis* Brsk. I pronounced in 1916 a synonym of *S. ruficollis* F., and *xanthodera* Bl. I believe to be another synonym of that species. Only three species, all of them Indian, therefore remain, but to them a few more, not yet recorded, must be added.

*Schizonycha* was first characterized by Blanchard in 1845, without mention of its species, but the omission was rectified in Cat. Coll. Mus. Paris, 1851 (p. 149), and *S. ruficollis* F., there included, and perhaps the widest-ranging and most abundant species, may be regarded as its type. This insect, which seems to abound throughout India and Ceylon, was supposed by Blanchard to be confined to Southern India, and his *S. xanthodera*, attributed to Northern India, is almost certainly identical with it. One of the best means of identifying the species

of the genus is afforded by the two spurs at the end of the hind tibia, especially in the male. In *S. ruficollis* F. one of these spurs is long, acute and bisinuate and the other very short and hooked at the end (see fig. 1). This insect has been taken in very large numbers at light in Bihar and the female has been found at the roots of ground-nut, on which no doubt the larvæ feed, in Madras. It appears to be equally common in Ceylon.

In *S. fuscescens* Bl., which is found in abundance, together with *S. ruficollis*, in Bihar, as well as in Bengal (Ranchi) and Bombay (Poona), the longer hind spur of the male is flat and leaf-like and the shorter one T-shaped (fig. 2). This species has been found at the roots of indigo and Beba (? Beda) and also upon rose-bushes

Figs. 1-6.



In *S. hauseri* Nonfr. both spurs are slender and acute. This, the smallest Asiatic species of the genus, has been taken at Surat, in Bombay Presidency, and Nagpur, in the Central Provinces. It is a peculiar form with a very long curved club to the antenna of the male. Although I have seen many males the female appears to be unknown, which is not infrequently the case with Melolonthinae of which the males have exceptionally developed antennæ. The females are sluggish and sometimes wingless and therefore difficult to find.

In another species, here described as *S. decipiens*, which closely resembles *S. ruficollis*, the larger tibial spur is very broad and the other, which arises, not at the extremity of the tibia but at its side, is sharp and bears a lateral tooth (fig. 3).

The following Table includes all the species of *Schizonycha* at present known to occur in Asia.

1 (10).	Metasternum hairy, without scales or setæ at sides.	
2 (3).	Metasternum thickly clothed with hair ..	<i>nigrofusca</i> Arrow.
3 (2).	Metasternum scantily clothed with hair.	
4 (7).	Deep red, larger.	
5 (6).	Pronotum lightly punctured, its hind angles sharp .....	<i>pygidialis</i> , sp. n.
6 (5).	Pronotum strongly punctured, its hind angles obtuse .....	<i>fuscescens</i> Bl.
7 (4).	Smaller, elytra pale yellow.	
8 (9).	Upper surface not very strongly or closely punctured, its setæ very minute .....	<i>ruficollis</i> F.
9 (8).	Upper surface strongly punctured, its setæ distinct .....	<i>decipiens</i> , sp. n.
10 (1).	Metasternum bearing white scales or setæ at sides.	
11 (14).	Metasternal setæ numerous, long and close.	
12 (13).	Metasternal setæ narrow .....	<i>squamulata</i> Brsk.
13 (12).	Metasternal setæ broad and squamiform .	<i>yemenensis</i> , sp. n.
14 (11).	Metasternal setæ scanty and minute .....	<i>hauseri</i> Nonfr.

*Schizonycha nigrofusca* Arrow.

This species, originally found in Somaliland, has since been recorded from Abyssinia and the Sudan (Scott, Ann. & Mag. Nat. Hist. (11) vi. 1940, p. 10). It is now seen to have a still wider range. Certain scarcely appreciable differences in the form of the clypeus, accompanied by corresponding slight differences in the ædeagus of the male, can be detected in different parts of the area of distribution. Since only a few examples have been taken in localities widely separated, it is likely that more thorough collecting would show the variation to be continuous, except possibly in the case of the desert race taken by Mr. Philby, which I have called the subspecies *arabica*. In this the clypeus is distinctly longer and narrower than that of the type-form from Somaliland; that of specimens from Aden, however, is rather intermediate. The ædeagi of males from the three regions are represented in figs. 4, 5 and 6, fig. 4 being that of the type-form.

*Schizonycha nigrofusca*, subsp. *arabica*, nov.

Pitchy-red, with the head and pronotum almost black, the pronotum and elytra bearing numerous very minute setæ, the metasternum and femora clothed with long brownish-grey hair and the sides of the abdomen with

short, close-lying hairs or setæ. Moderately elongate, cylindrical, shining, the head closely granular, the clypeus a little produced, its sides nearly straight and the front margin almost imperceptibly sinuated. Pronotum and elytra strongly and evenly punctured, the sides of the pronotum strongly angulated behind the middle and almost straight to the front and hind angles, which are well marked but obtuse. Pygidium rather lightly but numerously punctured and bearing extremely minute setæ. Front tibia strongly tridentate. Spurs of the hind tibia slender in both sexes, blunter in the female. Second joint of the hind tarsus longer than the basal one. *Ædeagus* of male, fig. 6. Length 15–19 mm.

ARABIA: Mecca (April), Medina (June), Taif (May, Aug., Sept.), Jidda (April, Nov.), Najd Mts., Dafina (Nov.).

This form was found in abundance by Mr. H. St. J. Philby.

*Schizonycha squamulata* Brsk.

A specimen taken in Aden in 1885 by the late Col. J. W. Verbury belongs to an African species which I believe to be *S. squamulata* Brsk. and perhaps also *S. sansibarica* Kolbe, described in the same year, 1895, as from Zanzibar I., but both descriptions are too scanty for certain identification. It is nearly related to the Abyssinian *S. hamifera* Moser, but considerably smaller, and the shorter spur of the hind tibia has not, in the male, the hooked form suggested by the name *hamifera*. It is a very elongate insect, its upper surface clothed with very evident narrow tapering scales or setæ and the sides of the metasternum rather closely covered with much larger but similarly shaped scales. The male has a smooth, strongly arched abdomen and its hind tibia has the shorter spur very blunt, as though broken at the end, and almost chisel-shaped. It has a very wide range, being found in Somaliland, Kenya, as far as Mombasa, and even in Tanganyika (Masailand).

*Schizonycha pygidialis*, sp. n.

Dark red, with the head and pronotum almost black, very shining above and beneath, thinly clothed at the sides beneath with long pale close-lying setæ and above with extremely minute and inconspicuous setæ.

Cylindrical, moderately elongate, with the head not very closely granular, the clypeus broad, rounded, straight in the middle of the front margin, separated from the forehead by a strong sharp carina; pronotum coarsely, deeply, but not very closely punctured, almost smooth just before the basal margin, the sides angulate behind the middle, the front angles obtuse and the hind angles acute; the elytra strongly and rather closely punctured. Pygidium triangular, rather narrow, the surface alutaceous, not distinctly punctured, scantily and minutely setose, excavated on each side, the lateral margins strongly elevated, almost continuous but lightly excised at the apex, the lower surface bilobed, bearing a few large setiferous punctures. Prosternum bidentate behind; metasternum and abdomen smooth in the middle. Front tibiae strongly tridentate.

Length 17 mm.

S. ARABIA: Lahej, Aden (*R. Blayney Percival*).

Only a single female specimen has been taken.

Although very similar in general appearance to *S. nigrofusca*, this species is easily recognizable by the scanty clothing of its lower surface, composed of stiff and rather scattered setae, chiefly confined to the sides, and by the peculiar form of the pygidium, which is hollowed on each side and a little produced and recurved at the end, forming a ventral surface, its tip feebly bilobed. This feature is perhaps peculiar to the female. The post-coxal process of the prosternum has a pair of short divergent lobes behind.

*Schizonycha yemenensis*, sp. n.

Chestnut-red, the upper surface sprinkled with very small white scales, the metasternum and hind coxae clothed rather closely, except in the middle of the former, and the sides of the abdomen beneath less closely, with elongate scales, the 5th sternite bearing also numerous long stiff hairs.

Cylindrical, rather long and narrow, the head closely and coarsely granular, the clypeus short and rounded, almost straight in front, separated from the forehead by a strongly arcuate carina; pronotum unevenly granular, the hind margin and posterior median part smooth, sometimes with a few strong punctures, the sides strongly angulate behind the middle, the front angles very obtuse and hind angles broadly rounded; elytra and pygidium

strongly and rather uniformly punctured. Front tibia tridentate, the 3rd tooth far from the 2nd.

Length 14–15 mm.

YEMEN, S. ARABIA : El Kubar (*G. W. Bury*).

Described from four female examples.

Although similar in its general appearance to *S. pygidialis*, this is smaller and easily distinguished by the different character of its clothing. The upper surface bears small but plainly visible white scales, and the metasternum and hind coxæ are rather closely clothed at the sides with larger and longer scales. The pronotum is granular at the sides and behind the front margin and strongly and irregularly punctured in the anterior middle region but, except at the sides, the posterior part is smooth, with a few strong punctures. The pygidium is convex, narrow and strongly punctured.

*Schizonycha decipiens*, sp. n.

Chestnut-red, with the head deep red and the elytra tawny yellow, the upper surface with a clothing of fine elongate white setæ, the metasternum strongly punctured at the sides and middle and bearing short white setæ in the middle and fine, close-lying hairs at the sides.

Cylindrical, elongate, not very shining, with the clypeus short, shining, straight in front, rounded at the sides, divided by a nearly straight carina from the rugose forehead ; the pronotum strongly and closely punctured, the lateral margins strongly angulate behind the middle, the front angles obtuse and the hind angles sharp ; the elytra strongly and closely punctured ; the pygidium broad and convex, with fairly numerous deep punctures. Uppermost tooth of the front tibia almost obsolete.

♂. Hind tibia bearing two long spurs, one broad and leaflike, the other slender, acute, with a lateral tooth (fig. 3).

Length 14 mm.

INDIA : ? Assam.

The single male specimen from which this species is described formed part of the former collection of the East India Company, transferred to the British Museum in 1860. Its label names Dr. Cantor as the collector and China as the habitat but, as it was accompanied by a specimen of *S. ruficollis* F. with an identical label, it is evidently Indian. Dr. Cantor, who collected insects in Canton and Chusan, received many Coleoptera from a

correspondent in Assam, and that is therefore its probable country of origin. Bearing, as it does, a deceptive resemblance to *S. ruficollis*, of which it has the size, form and colour, it seems desirable to call attention to the specific differences. The punctures upon the pronotum and elytra are stronger and more numerous and the setæ springing from them longer and more conspicuous. The sides of the metasternum also are more strongly and closely punctured and moderately closely clothed with long hairs. The front tibia is less stout and the 3rd tooth almost absent. The latter is probably distinct in the female. In the male both spurs of the hind tibia are long, the larger one broad, flat and blunt and the other, which arises not from the extremity of the tibia but before it, is slender, acuminate and sharply toothed near the middle of its outer edge. The ædeagus of the male has much broader paramera than those of *S. ruficollis*.

XXI.—*New Species of African Cryptocephalus* (Chrysomelidæ, Cryptocephalina, Col.). By G. E. BRYANT, F.R.E.S., Imperial Institute of Entomology.

ALL the types of the following new species are in the British Museum (Natural History).

*Cryptocephalus triangulifer*, sp. n. (Fig. 1.)

Flavous, a triangular median black patch on the prothorax, the six apical segments of the antennæ black, the elytra metallic blue and punctate-striate.

Length 2 mm.

♂♀.—Head flavous, feebly punctured. Antennæ rather short, extending just beyond the base of the prothorax, the five basal segments flavous, the remainder black, the first segment dilated and longer than the second and third together, the second short and rounded, the third to the fifth slender and about equal to each other. Prothorax transverse, widest at the base, the sides slightly rounded and contracted in front, flavous, nitid, triangular. Elytra metallic blue, the sides slightly tapering to the apex and then rounded, strongly punctate-striate. Legs flavous. The male with the first segment of the anterior tarsi more dilated. Underside flavous, the metasternum and ventral segments of the abdomen tinged with fuscous.



N.W. RHODESIA: Mwengwa, 28. vii. 1913 (*H. C. Dollman*), 2 specimens.

Somewhat allied to *C. chalybeipennis* Suff. in colour, but differs in its much smaller size, the stronger punctura-

Figs. 1-9.



9

1. *C. triangulifer*, sp. n.
2. *C. amphoralis*, sp. n.
3. *C. unicoloratus*, sp. n.
4. *C. opideres*, sp. n.
5. *C. designatus*, sp. n.

6. *C. cupricollis*, sp. n.
7. *C. tablensis*, sp. n.
8. *C. planicollis*, sp. n.
9. *C. eatcourtensis*, sp. n.

tion of the elytra, and the elytra entirely blue, without the apex red, and in having a black triangular patch on the prothorax.

*Cryptocephalus amphoralis*, sp. n. (Fig. 2.)

Flavous, the prothorax with the central portion chestnut, with two longitudinal black curved markings, the elytra flavous, with the suture broadly black, expan-

ding behind the middle into a round patch, the side margins very narrowly black and a black spot on the shoulders, finely punctate-striate.

Length 2 mm.

♂♀.—Head flavous, a longitudinal median chestnut impression between the eyes, extending to the base, finely punctured. Antennæ flavous, short, extending just beyond the base of the prothorax, the six apical segments more dilated. Prothorax with the central portion chestnut, with the margins narrowly flavous, with two longitudinal black curved markings on each side curving in at the base towards the scutellum, the sides slightly rounded and contracted in front, very nitid and impunctate. Scutellum flavous, margined with black, triangular, nitid. Elytra with the sides almost straight and rounded at the apex, flavous, with a black spot on the shoulders and the side margins narrowly black, the suture broadly black from the base to the middle, the sides slightly contracted and then expanding into a round patch before the apex: in some the basal portion is more chestnut coloured and not so black, punctate-striate. Legs flavous. Underside flavous, the first ventral segment the longest, the second to the fourth all equal to each other, and each shorter than the first, clothed with short golden pubescence.

N.W. RHODESIA: Kashitu, N. of Broken Hill, vii. 1915 (*H. C. Dollman*), 9 specimens.

S. RHODESIA: Mpudzi R., Manica, 26. x. 1905 (*Sir G. A. K. Marshall*), 1 specimen.

Allied to *C. linearis* Suff., but differs in colour, especially the prothorax, and in having the black suture more developed.

*Cryptocephalus uninotatus*, sp. n. (Fig. 3.)

Flavous, the head and prothorax slightly darker than the elytra, the prothorax with a diamond-shaped black spot in the centre, elytra with the suture black and the side margins narrowly black.

Length 2.5 mm.

♂♀.—Head flavous, impunctate. Antennæ extending just beyond the base of the prothorax, the five basal segments flavous, the six apical segments tinged with fuscous, the first segment more dilated and about equal to the second and third together. Prothorax flavous, slightly darker than the elytra, with a black diamond-shaped spot in the centre, impunctate and nitid, trans-

verse, widest at the base, the sides rounded and contracted in front. Scutellum black, with a fulvous spot in the middle, triangular and impunctate. Elytra flavous, a black spot on the shoulders the suture, and the side margins narrowly black, punctate-striate, the sides slightly tapering to the apex, which is rounded. Legs flavous, with the claws fuscous. Underside flavous, the first ventral segment of the abdomen long, about equal to the second and third together. The male has the first segment of the anterior tarsi more dilated, and the antennæ slightly longer.

N.W. RHODESIA: Mwengwa, 6. viii. 1913 (*H. C. Dollman*), 5 specimens.

A very distinct species, somewhat allied to *C. pullus* Suff.

*Cryptocephalus opideres*, sp. n. (Fig. 4.)

Flavous, the head black, the prothorax with two black patches meeting in the centre, margined with flavous, elytra flavous, with the suture and side margins narrowly black, very finely and somewhat irregularly punctate-striate.

Length 2.5 mm.

♂♀.—Head black, the clypeus and labrum tinged with fulvous, nitid and finely punctured, a small yellow patch touching the inner margin of the eyes. Antennæ with the five basal segments flavous, the remainder fuscous, extending well beyond the base of the prothorax, the six terminal segments more dilated. Prothorax transverse, the sides rounded and contracted in front, impunctate, nitid, the central portion black, formed by two irregular rounded patches meeting in the middle, margined with flavous. Scutellum flavous, margined with black, triangular, impunctate. Elytra with the sides almost parallel, rounded at the apex, flavous, with the suture and side margins very narrowly black, a black spot on the shoulders, very finely and somewhat irregularly punctate-striate. Legs flavous, with the tarsi fuscous. Underside black, with the ventral segments of the abdomen fulvous, the apical segments paler and clothed with a fine short pubescence.

S. AFRICA: Port St. John, ix.—x. 1923 (*R. E. Turner*), 2 specimens; Somerset East, x. 1930 (*R. E. Turner*), 1 specimen; Dunbrody (*Rev. Father J. A. O'Neil*), 1 specimen.

Allied to *C. linearis* Suff., but differs chiefly in colour and pattern.

*Cryptocephalus designatus*, sp. n. (Fig. 5.)

Flavous, the head black, clypeus and labrum fulvous, prothorax with two black spots and two black longitudinal curved lines, elytra with two short basal lines, and a black line extending from the shoulder, not quite reaching the apex, the suture black. Underside tinged with black.

Length 3 mm.

Head black, strongly but not closely punctured, the clypeus and the labrum fulvous. Antennæ flavous, slender, extending beyond the base of the prothorax, the basal segment the longest. Prothorax widest at the base, the sides rounded and contracted in front, finely punctured, flavous, with a black spot each side of the centre, and a black longitudinal incurved line on the basal half near the side margin. Scutellum flavous, margined with black, impunctate. Elytra with the sides slightly tapering to the apex, strongly punctate-striate, flavous, the suture narrowly black, a short black line near the base between the fourth and fifth striae, and a black line extending from the shoulder, not reaching the apex. Legs flavous, underside flavous, the meso- and metasternum black, the ventral segments of the abdomen punctured.

ZULULAND: Lower Tugela, x. 1902 (*E. D. Reynolds*), 2 specimens; Eshowe, 22. iv. 1936 (*R. E. Turner*), 1 specimen.

Allied to *C. nigrofrontalis* Jac., but smaller, and the pattern different.

*Cryptocephalus cupricollis*, sp. n. (Fig. 6.)

Flavous, the head and prothorax coppery black, nitid, the elytra with the suture, a spot on the shoulders coppery black, and the side margins very narrowly edged with black.

Length 2.5 mm.

♂.—Head deep coppery black, with the labrum fulvous, strongly punctured, with a transverse impression between the base of the antennæ. Antennæ short, only extending to the base of the prothorax, the five basal segments flavous, the remainder tinged with fuscous, the first segment more dilated and about equal in length to the second and third together, the six terminal segments short and about equal to each other. Prothorax deep

coppery black, very nitid and impunctate, transverse, widest at the base, the sides slightly contracted in front. Scutellum deep coppery black, nitid and triangular. Elytra pale flavous, the suture broadly coppery black, expanding at the apex, a dark spot on each shoulder, the side margins very narrowly black, finely punctate-striate. Legs flavous. Underside with the metasternum and the ventral segments of the abdomen flavous.

NATAL : Malvern, iii. 1897 (*Sir G. A. K. Marshall*), 1 specimen ; Hawick, i. 1899 (*Dimock Brown*), 1 specimen.

Allied to *C. linearis* Suff., but differs in the elytral pattern and in being more convex and less oblong.

*Cryptocephalus tablensis*, sp. n. (Fig. 7.)

Below fuscous, head blue-black, prothorax fulvous, with two blue-black elongate spots, elytra fulvous, the base and suture narrowly blue-black, and a blue-black stripe from the shoulder, not extending to the apex, on each side.

Length 2.5 mm.

Head blue-black, finely punctured. Antennæ fulvous, extending slightly beyond the base of the prothorax, the first segment more dilated, about equal to the second and third together, the fourth and fifth equal, more elongate, each longer than the third, the sixth to the eleventh all about equal and more dilated. Prothorax transverse, widest at the base, the sides rounded and contracted in front, impunctate and nitid, fulvous, with two blue-black somewhat ovate spots. Scutellum triangular, blue-black, impunctate. Elytra with the sides slightly tapering to the apex, fulvous, the base narrowly blue-black, the suture more broadly blue-black, slightly contracted in the middle, a blue-black stripe from the shoulder, not reaching the apex, the inner margin contracted in the middle, punctate-striate, the punctures not very close. Legs fulvous, the femora fuscous. Underside fuscous.

CAPE COLONY : Table Mountain, 1906 (*W. Bevins*), 2 specimens.

Allied to *C. callias* Suff. in structure, but pattern different and the blue not so bright.

*Cryptocephalus planicollis*, sp. n. (Fig. 8.)

Below black, head fulvous, with the base black, the labrum black, prothorax fulvous, narrowly margined with

flavous, elytra flavous, with two black stripes, and the suture narrowly black.

Length 3 mm.

♂♀.—Head fulvous, the labrum black, the base of the head narrowly black, impunctate, a median longitudinal impression at the base. Antennæ entirely black, extending beyond the base of the prothorax. Prothorax fulvous, narrowly margined with flavous, impunctate, nitid, widest at the base, the sides rounded and contracted in front. Scutellum flavous, margined with black, impunctate. Elytra slightly tapering to the apex and thence rounded, flavous, the suture and base narrowly black, a broad black stripe extending from the shoulder almost to the apex, not touching the side margin, finely punctate-striate. Legs entirely black. Underside entirely black, clothed with short, fine, scattered pubescence, the female with a deep fovea on the apical segment.

NATAL: Van Reenen, Drackensberg, xii. 1926 (*R. E. Turner*), 5 specimens.

Allied to *C. tablensis* Bry., but less convex, more flattened, without the black pattern on the prothorax, and the legs and antennæ entirely black.

*Cryptocephalus estcourtiensis*, sp. n. (Fig. 9.)

Below fulvous, with metasternum black, the head fulvous, the base narrowly black, prothorax fulvous, with two black spots, elytra flavous, with the suture and two striae black.

Length 3 mm.

♂♀.—Head fulvous, the basal portion narrowly black and the labrum black, strongly punctured, impressed between the eyes. Antennæ short, extending just beyond the base of the prothorax, the five basal segments fulvous, the remainder black, the first segment long and dilated towards the apex, longer than the second and third together, the third and fourth more slender than the rest. Prothorax widest at the base, the sides rounded and contracted in front, nitid and impunctate, fulvous, with two irregular black spots on the anterior half. Scutellum black, triangular, impunctate and nitid. Elytra flavous, the suture broadly black, with the margin irregularly notched, the base very narrowly black, a black stripe extending along the side margins, but not touching, finely punctate-striate. Legs fulvous, with the tarsi

black. Underside fulvous, the metasternum black, the ventral segments clothed with fine, short, golden pubescence.

NATAL : Estcourt, xi.-xii. 1892 (*Sir G. A. K. Marshall*), 2 specimens; Lower Tugela, 1902 (*E. Reynolds*), 1 specimen.

Allied to *C. tablensis* Bry., but differs in the contrast of colour of the prothorax and elytra, the differently formed spots on the prothorax, and in the form of the elytral stripes.

## XXII.—On Two Terrestrial Isopoda new to the Irish Fauna.

By WALTER E. COLLINGE, D.Sc., President of the Northern Ecological Association.

IN a collection of woodlice recently made at various localities in Co. Down, Ireland, by Dr. R. S. Bagnall, and kindly placed in my hands, there are specimens of two species which have not hitherto been recorded as occurring in Ireland, viz., *Trichoniscoides sarsi* Patience and *Porcellio ratzeburgii* Brandt.

A recent writer asks \* if I have " come to the conclusion that everything which occurs in England is also likely to be found in Ireland ? " I have come to no such conclusion, but I do think, and with ample evidence, that of the species of woodlice found in Great Britain, most of them will, after careful investigation, be found to occur in Ireland. Such a view receives overwhelming support from the record of the past fifty years, during which period the number of species recorded has almost doubled.

Kinahan † in 1857 recorded eleven species for Ireland. Scharff ‡ in 1894 listed fifteen species. Foster § in 1907 mentions seventeen species. Pack-Beresford and Foster || in 1909 gave twenty-three species, while in 1911 the same authors ¶ record twenty-five species. Since that date two more species have been added bringing the total to twenty-seven. Since the publication of Scharff's list a dozen species have been added to the Irish fauna.

\* Irish Nat. Journ. 1943, viii. pp. 135, 136.

† Nat. Hist. Rev. 1857, iv. pp. 258-283, pls. xx.-xxii.

‡ Irish Nat. 1894, iii. pp. 4-7, 25-29, pl. ii.

§ Ibid. 1907, p. 302.

|| Ibid. 1909, pp. 92-94.

¶ Proc. Roy. Irish Acad. 1911-12, xxix. Sect. B, pp. 165-190, pl. viii.

*Trichoniscoides sarsi* Patience.

Ann. & Mag. Nat. Hist. 1908, ii. p. 84, pl. vi.

Body narrowly oval, dorsally convex, with transverse rows of minute tubercles. Pleura with appressed spines. Cephalon transversely oval, lateral lobes very small, frontal line evenly arcuate. Flagellum of antennæ composed of four joints. Telson narrowly truncate with two apical spines. Colour golden yellow, occasionally with pinkish tinge.

Length 4 mm.

*Locality*.—Killinchy, Co. Down, Ireland, 28. xi. 1943 (R. S. Bagnall).

*Porcellio ratzeburgii* Brandt.

Bull. Soc. Imp. Nat. Moscou, 1833, vi. p. 177.

Ever since I recorded *P. rathkii* Brandt \* as an addition to the Irish fauna, I have thought that *P. ratzeburgii* would ultimately be found.

I have previously recorded and commented upon this species in Great Britain † and more recently ‡ pointed out that it has now been recorded from twelve English, two Welsh and two Scottish counties.

*P. ratzeburgii* differs from other species of the genus in the following characters :—

(i.) The proximal joint of the flagellum of the antenna is only about half the length of the distal joint.

(ii.) The frontal lobe of the cephalon is well produced and almost semicircular.

(iii.) The lateral cephalic lobes are narrowly rounded at the extremities, sloping inwardly.

(iv.) It is slightly smaller than *P. rathkii* Brandt.

*Locality*.—Killinchy, Co. Down, Ireland, 28. xi. 1943. (R. S. Bagnall).

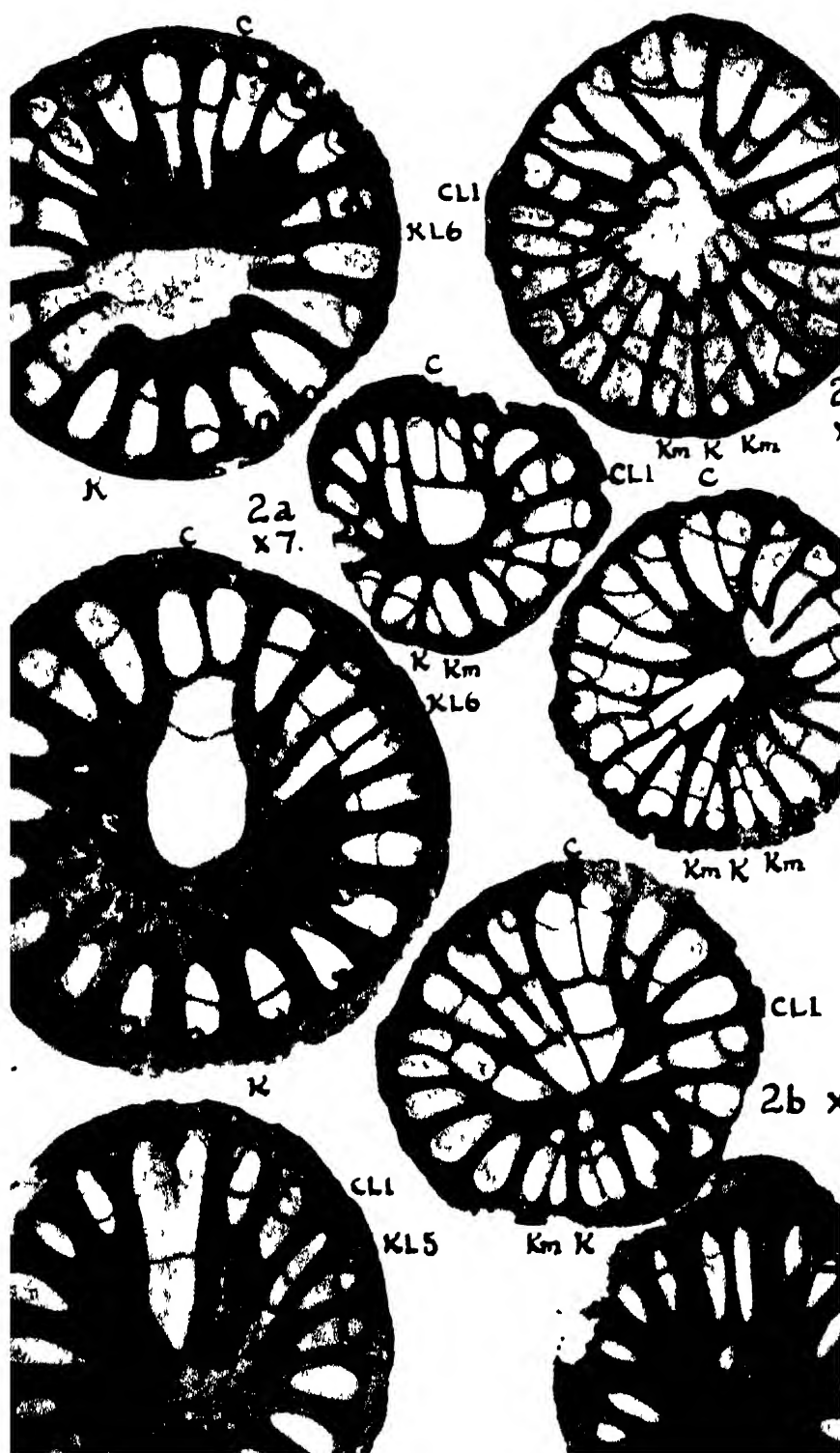
I wish to express my thanks to Dr. Bagnall for his long and continued assistance in my work on the distribution of the Terrestrial Isopoda in the British Isles.

\* Irish Nat. 1918, xxviii. pp. 1-2.

† Lanc. & Ches. Nat. 1917, p. 307; Scot. Nat. 1917, pp. 251, 252; Journ. Zool. Res. 1918, iii. pp. 103-105.

‡ Nth. West. Nat. 1943, xviii. p. 14.







# THE ANNALS AND MAGAZINE OF NATURAL HISTORY.

[ELEVENTH SERIES.]

No. 76. APRIL 1944

XXIII. *Some new Ordovician Lamellibranchs from Girvan.*  
By F. R. C. REED, Sc.D., F.G.S.

[Plate II.]

SINCE the publication of Dr. Wheelton Hind's memoir in 1910 on the "Lamellibranchs of the Silurian Rocks of Girvan," further collections of mollusca have been made from that area, and a few specimens have been submitted to me by Mr. L. J. Bogg of Glasgow and Mr. R. P. Tripp of Edinburgh, which appear to be new and are therefore described in this communication.

*Whitella aliena*, sp. nov. (Pl. II. figs. 1, 1 a, 1 b.)

Shell transversely subtriangular, inequilateral, highest anteriorly; umbo large, elevated, subanterior, arched down and directed forwards, incurved, rising high above hinge-line, with concave lunule below it; posterior end of shell narrowed, obliquely truncated above, subacute ? below; hinge-line short, straight. Surface of valve divided into a large convex lower anterior portion and a narrow concave posterior cardinal slope by a sharply rounded arched, slightly sigmoidal carina. Anterior muscle-scar deeply sunken, marginal, subcircular, well defined, having one or two short subparallel teeth immediately above it at the anterior end of the hinge-line.

Surface of valve with weak, narrow, concentric growth-ridges near anterior lower part.

*Dimensions.*—

(R. Tripp Coll.)

	mm.
Height at umbo .....	c. 36
Length of shell .....	+ 42

*Horizon and Locality.*—Starfish Bed, Drummuck Group, Ladyburn.

*Remarks.*—There is only one internal cast of the greater part of a left valve available for the description of this species and it has the posterior end missing and the ventral margin broken. But from its general characters we may refer it to the genus *Whitella* Ulrich, and it appears to be allied to *Wh. subcarinata* Ulrich (1894, p. 572, pl. xli. figs. 22, 23 ?) from the Galena and Trenton, but the carination of the valve is more arched and does not die out posteriorly. The shape of our specimen, convexity and arched sharp carination of the valve, also resemble *Wh. acutiumbonis* Stewart (1920, p. 20, pl. i. figs. 19–21), as re-defined by Foerste (1924, p. 158, pl. xxii. figs. 1 a, b), but our Girvan specimen has not the radial grooves as in that Lorraine species. We may compare also *Wh. complanata* var. *moniquensis* Foerste (1924, p. 153, pl. xxi. fig. 2 *non ut.*), which occurs in the Lorraine beds of Ontario and has an ungrooved shell but a less acute carination. *Wh. obliquata* Ulrich (1894, p. 565, pl. xl. figs. 31, 32; Foerste, 1924, p. 153, pl. xvii. fig. 13) agrees with our species in the greater sharpness of the carina and in the concave cardinal slope above it, while in *Wh. sterlingensis* (Meek & Worthen), from the Richmond beds of Illinois (Foerste, 1924, p. 154, pl. xvii. pp. 14 a, b), the carination is continued as in the Girvan species to the posterior end of the shell, which is similarly subacute. The shell which Billings named *Cyrtodonta hindi* (1865, p. 151, fig. 131 a, b), from the Hudson River Group, is now put in the genus *Whitella* and bears a considerable resemblance to the present

*Cyrtodonta reposita*, sp. nov. (Pl. II. fig. 5.)

Shell transversely subquadrate, rounded, gently convex; umbo broad, obtuse, subanterior, directed forwards, scarcely rising above dorsal margin, with slight excavation of anterior edge immediately below it. Interior

with thickened marginal band and simple pallial line ; anterior muscle-scar subtriangular, rather large, marginal, situated close below umbo, deeply sunk, strongly corrugated. Surface of valve with a few concentric striæ and corrugations and traces of a narrow weak diagonal groove from umbo to ventral margin near posterior end.

*Dimensions.* -

(B.G. 0765.)

	mm.
Length .....	11.5
Height .....	9.5

*Horizon and Locality.* - Balclatchie Beds, Balclatchie.

*Remarks.* - There is only one small specimen of this species in Mr. Begg's collection, but it consists of the internal cast of a nearly perfect left valve. As far as its shape indicates it appears to be much like *Cyrtodonta bidens* Isberg (1934, p. 238, t. 19, figs. 1 a-c) and *C. ? bodæ* Isberg (1934, p. 250, t. 19, figs. 7 a, b) from the Leptæna Limestone of Sweden. The faint diagonal groove on the valve of the Girvan specimen may be accidental. There are also several American species of *Cyrtodonta* which it resembles in shape, though unfortunately we do not know its dentition. Such are *C. glabella* Ulrich (1894, p. 543, pl. xxxix. figs. 37-40), *C. persimilis* Ulr. (1894, p. 544, pl. xxxix. figs. 41-44) and *C. obesa* Ulr. (1894, p. 542, pl. xxxix. figs. 11, 12), all from Upper Ordovician beds. But, as Ulrich says (1894, p. 550), *Vanuxemia* can only as a rule be distinguished from *Cyrtodonta* by the more nearly terminal position and greater prominence of the beaks, though the only final and reliable test is in the position and character of the adductor muscle-scar, which is excavated out of the hinge-plate. Wh. Hind (1910, p. 510) put Hall's genus *Palæarca* as a synonym of *Cyrtodonta*, but all Salter's species of *Palæarca* (1866, pp. 341-344) seem distinct and some undoubtedly belong to *Vanuxemia*. Bradley (1930, p. 231, pl. xxv. fig. 18) has figured a Lamellibranch from the Kimmswick Limestone of Missouri under the name *Cyrtodonta sulcata*, which appears to bear a considerable resemblance to this Girvan species.

*Plethocardia propinqua*, sp. nov. (Pl. II. figs. 3, 3 a-c.)

Shell strongly convex, obliquely suboval, hinge-line straight, about two-thirds length of shell ; ventral margin

moderately convex, sweeping up behind into sharply rounded posterior end; cardinal angles obtuse; surface of valves tumid anteriorly, decreasing rapidly in convexity towards posterior end, sharply carinated in umbonal region, the carination dying out at about half the length of the valve, and the upper portion of valves becoming flattened at about  $60^\circ$  to rest of surface and somewhat excavated. Umbones large, subterminal, anterior, elevated, rising high above hinge-line, acutely carinate, directed forwards, closely incurved and approximate. Lunule small, deep, subcordate. Hinge-line with one subparallel lateral linear tooth. Surface of valves with a few concentric growth-striae and lamellose growth-lines.

*Dimensions.*—

(B G. 9762.)

	mm.
Length (oblique).....	c. 17.0
Height at umbo .....	10.5
Depth of one valve at umbonal carination.....	6.5

*Horizon and Locality.*—Balclatchie Beds, Balclatchie.

*Remarks.* - There is one nearly complete shell of this species, both valves being in position and the left one nearly perfect. Its nearest relative seems to be *Plethocardia umbonata* Ulrich (1894, p. 576, pl. xl. figs. 22-24), from the Trenton Shales of Minnesota, rather than any species of *Vanuxemia*, but we do not completely know its internal cardinal characters, which were described by Ulrich for his species of *Plethocardia*. It may be suspected that the shell which Wh. Hind described as *Vanuxemia distans* Wh. Hind (1910, p. 514, pl. v. figs. 31-33) belongs to this genus or even may be identical with the new species, as he was very doubtful as to its generic reference, but his definition of its characters does not quite agree and no mention is made of its internal features or teeth.

*Warburgia asteroidea*, sp. nov. (Pl. II. figs. 4, 4 a.)

Shell obliquely subrhomboidal, rounded, increasing rather rapidly in height posteriorly. Right valve moderately convex, most so in middle having low broad rounded indefinite umbonal ridge dying out before reaching ventral margin; umbo broad, obtuse, low, rising slightly above hinge-line, situated subanteriorly; anterior end of shell small, projecting, sharply rounded and passing back into ventral margin which is oblique, almost straight, except

for a broad shallow emargination in anterior half, and sweeps up behind into the broadly rounded high posterior end of the shell; dorsal margin straight, less than length of shell, with obtusely rounded posterior cardinal angle. Interior with long posterior lateral tooth, and a single short stout cardinal tooth below the umbo; anterior submarginal muscle-scar large, suboval, well defined and situated close below and in front of umbo; two small deep pits representing accessory or pedal muscle-scars on the pre-umbonal slope; pallial line entire; posterior muscle-scar indistinct.

*Dimensions.* —

(R. Tripp Coll.)

	mm.
Length (oblique) .....	15.0
Height (posterior) ..	10.5

*Horizon and Locality.*—Starfish Bed, Drummuck Group, Ladyburn.

*Remarks.* There is one good internal cast of a right valve in Mr. R. P. Tripp's Collection: it has the long posterior lateral tooth and the peg-like cardinal tooth as well as the shape of the shell which Foerste (1924, p. 148, pl. xxiii. fig. 10) named *Ischyrodonta ? manitoulinensis*, from the Upper Ordovician of Manitoulin Island. In shape it also resembles *Modiolopsis subgradata* Reed (1905, p. 500, pl. xxiv. figs. 5, 6), from the Slade beds of Haverfordwest, of which the internal characters are unknown, and the Upper Llandovery shell from Girvan to which Wh. Hind (1910, p. 504, pl. ii. figs. 16, 17) gave this pre-occupied specific name.

The species which Hussey named *Cyrtodonta potteri* (1928, p. 164, pl. ix. figs. 9–11), from the Richmond beds of Michigan, bears a very close resemblance to our Girvan specimen, but the latter should probably be put in Isberg's new genus *Warburgia* (1934, p. 263), which is considered to be much like *Ischyrodonta* and *Ortonella*. The two shells from the Richmond beds of Manitoulin Island, which Foerste refers with a query to *Ortonella* under the specific names of *stewarti* (1924, p. 149, pl. xix. fig. 5) and *gorensis* (1924, p. 150, pl. xix. fig. 6), have much the same appearance as the Girvan specimen.

*Ambonychia baldclatchiensis*, sp. nov. (Pl. II. fig. 2.)

Shell triangular, highest posteriorly; dorsal margin straight, rather less than length of shell; posterior

cardinal angle obtuse, rounded, passing into high semi-circular posterior margin and below into short rounded inferior margin, which sweeps up obliquely into slightly arched anterior margin, becoming gently concave below the acutely pointed small umbones which project somewhat in front, and have an umbonal angle of about  $45^{\circ}$ . Valves compressed and flattened posteriorly, becoming convex anteriorly and especially towards umbo, sloping down gently to ventral margin but more steeply to anterior margin. Surface smooth.

*Dimensions.*—

	mm.
Length (oblique) . . . . .	16.0
Length of hinge line . . . . .	10.5
Height (posterior) . . . . .	11.5

*Horizon and Locality.*—Balclatchie Beds, Balclatchie.

*Remarks.*—There is only one specimen of this Lamellibranch in Mr. Begg's recent collection, but it consists of the external cast of a complete shell with both valves in position, the left valve is perfect, but the right valve is slightly displaced and the umbo broken off. We may compare this species with several of those described by Isberg from the Leptæna Limestone of Sweden, especially *Ambonychia pulchella* Lindstr. (Isberg, 1934, p. 59, t. 5, figs. 2 a-d), and with the specimens from the Balclatchie Beds referred by Wh. Hind (1910, p. 489, pl. i. figs. 28, 29) to *A. amygdalina* Hall, but the above-described shell is shorter, not so oblique and more broadly rounded posteriorly, the height also being rather greater than the length.

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## EXPLANATION OF THE PLATE

- Fig. 1. *Whatalla advena*, sp. nov. Internal cast of left valve.  $\times 1\frac{1}{2}$ . Starfish Bed, Drummuck Group, Ladyburn, Girvan. (R. Tripp Coll.)
- Fig. 1 a. Ditto. Inner view of umbonal region.  $\times 1\frac{1}{2}$ .
- Fig. 1 b. Ditto. Dorsal marginal view of same.  $\times 1\frac{1}{2}$ .
- Fig. 2. *Ambonychina balclatchiensis*, sp. nov. Left valve.  $\times 2\frac{1}{2}$ . Balclatchie Beds, Balclatchie. (B.G. 9722.)
- Fig. 3. *Plethocardia propinqua*, sp. nov. Left valve of nearly complete specimen.  $\times 2\frac{1}{2}$ . Balclatchie Beds, Balclatchie. (B.G. 9762.)
- Fig. 3 a. Ditto. Dorsal view of same.  $\times 2\frac{1}{2}$ .
- Fig. 3 b. Ditto. Anterior view of same.  $\times 2\frac{1}{2}$ .
- Fig. 3 c. Ditto. Inner view of umbonal region of left valve.  $\times \frac{1}{2}$ .
- Fig. 4. *Warburgia asterioidea*, sp. nov. Internal cast of right valve.  $\times 2\frac{1}{2}$ . Starfish bed, Drummuck Group, Ladyburn, Girvan. (R. Tripp Coll.)
- Fig. 4 a. Ditto. Dorsal marginal view of same.  $\times 2\frac{1}{2}$ .
- Fig. 5. *Cyrtodonta reposita*, sp. nov. Internal cast of left valve.  $\times 2\frac{1}{2}$ . Balclatchie Beds, Balclatchie. (B.G. 9765.)

#### XXIV. Notes on some new Ordovician Brachiopods from Girvan. By F. R. C. REED, Sc.D., F.G.S.

[Plate III.]

THE following new and undescribed Brachiopods from the prolific Ordovician Beds of the Girvan area have been recognized in recent collections made by Mr. J. L. Begg of Glasgow and Mr. R. Tripp of Edinburgh.

*Orthis (Glyptorthis) speciosa*, sp. nov.  
(Pl. III. figs. 1, 1 a.)

Shell transversely subsemicircular; hinge-line equal to width of shell; cardinal angles subrectangular. Pedicle-valve pyramidal, semiconical, slightly retrorse, subcarinate, being subangular and highest along middle line; umbo small, situated at apex of cone, not incurved nor rising above hinge-line; cardinal area large, triangular, inclined nearly at right angles to general surface of valve.

Surface of valve bearing about thirty regular sharply-rounded equal straight equidistant radiating costæ, mostly primaries, but with a few shorter ones arising a short distance from umbo : intercostal grooves narrower than ribs : ribs and grooves crossed by rather widely-spaced equidistant imbricating coarse concentric scabrous lamellæ, which nodulate the ribs and form pits in the

*Dimensions.*—

(R. Tripp Coll.)

	mm.
Length . . . . .	8.0
Width . . . . .	9.5

*Horizon and Locality.*—Startfish Bed, Ladyburn, Girvan.

*Remarks.*—This species is represented only by one sharp external impression of a pedicle-valve, which we must refer to the genus or subgenus *Glyptorthis* Foerste, and may compare it with *O. (Gl.) bellarugosa* Conrad, as figured and described by Raymond (1911, p. 245, pl. xxxvi. figs. 8, 9, 19, 20) from the Ordovician of the United States. But the ribs are less numerous in the Girvan form, so that it more resembles some specimens referred to *O. balclatchiensis* Dav. (Reed, 1917, p. 840, pl. vii. figs. 13–20), but the pedicle-valve is more conical and subcarinate and the intercostal grooves wider. Schuchert & Cooper (1932, p. 90) quote that species as belonging to *Glyptorthis*.

*Plectoronta thraivensis* (Reed), var. nov. *divergens*.

(Pl. III. figs. 3, 3 a.)

Shell transversely semielliptical, about twice as wide as long, widest along hinge-line, with slightly-pointed cardinal angles. Pedicle-valve convex, most so in middle ; umbo small, incurved ; hinge-line minutely denticulated along whole ? length. Interior of valve with pair of small short elongated deeply sunken linguiform muscle-scars in contact posteriorly but divergent anteriorly, with pointed ends and having on their outer side a pair of long straight divergent vascular trunks running obliquely forwards and outwards from the umbo for more than half the length of the valve ; rest of interior covered with small closely-placed pustules arranged in fairly regular radial lines ;

near the margin of the internal cast there are 20 22 radial equidistant short primary thread-like lines.

*Dimensions.*—

(B.G. 9558.)

	mm.
Length .....	11
Width.....	21
Convexity .....	5

*Horizon.*—Craighead Limestone, Craighead.

*Remarks.*—There is only one example of this variety, consisting of the internal cast of a pedicle-valve in Mr. Begg's collection (B.G. 9558), but the denticulated hinge-line, muscle-scars and vascular trunks are well preserved. It belongs to the genus *Plectodonta* Kozłowski rather than to *Sowerbyella* Jones, because of the denticulated hinge-line. It agrees best with *Plectambonites thraivensis* Reed (1917, p. 885, pl. xv. figs. 27-32), from the Drummuck Group and from the Slade Beds of Haverfordwest (Jones, 1928, p. 425, pl. xxi. figs. 21-23), but differs in the vascular sinuses being divergent instead of parallel as in the type-form.

*Chonetes (Eodevonaria) celtica*, sp. nov.

(Pl. III. figs. 2, 2 a.)

The one exterior of a small convex brachial valve in Mr. Begg's collection (B.G. 9748) is well preserved, with the hinge-areas of both valves attached, and has a transversely triangular shape with short-pointed cardinal angles. The middle portion of the valve is most strongly convex, and has the lateral portions somewhat depressed and sloping down on each side to the hinge-line and lateral angles. The surface of the brachial valve is covered with very fine radial lines, 180-200 in number, of equal strength except one median line which is much thicker. The hinge-area on this valve is narrow and has nearly parallel edges and a broad triangular delthyrium; the hinge-area of the pedicle-valve is triangular and inclined nearly at right angles to that of the brachial valve. Traces of three small widely equidistant spines along hinge-line can be seen.

*Dimensions.*—

(B.G. 9748.)

.....	5.5
Width.....	10.0

*Horizon and Locality.*—Balclatchie Beds, Balclatchie.

*Affinities.*—The species to which this shell appears to be most closely allied is the Norwegian brachiopod described as *Chonetoides triangularis* Reed (1932, p. 137, pl. xx. figs. 8-11), which has likewise a similar strong single median line on its surface and the rest much finer radial lines of equal strength, and it was compared for this reason with *Plectambonites centricarinatus* Ruedemann, from the Ordovician of New York. Brögger (1877, pl. ii. figs. 8, 9) named the Norwegian specimens *Leptaena*? sp., but we may with confidence place the Girvan specimen in the subgenus *Eodevonaria* Breger of *Chonetes*, and probably also the Norwegian species, for they both resemble *Ch. (Eod.) primigenius* Twenhofel (1914, p. 26, pl. i. figs. 4, 5; 1928, p. 199, pl. xviii. figs. 6-8), from the Upper Ordovician of Anticosti Island, but the greater median inflation of the brachial valve distinguishes them. We may suspect that the small shell from Rathdrum, which Davidson figured (1871, p. 330, pl. xlix. fig. 21) as *Leptaena* (vel *Chonetes*) *tenuissime-striata* McCoy, is allied.

*Strophomena planumbona* (Hall), var. nov. *girvanensis*.  
(Pl. III. fig. 5.)

Shell rounded, subquadrangular, widest along hinge-line, with short pointed subalate cardinal angles. Pedicle-valve flattened over greater part; margin sharply geniculated; interior with deeply sunken subrhomboidal muscle-scar, deepest posteriorly, composed of pair of flabellate conjoint diductors slightly separated at anterior end; teeth small, having adventitious narrow ridge running outwards from them at a small angle to hinge-line to join laterally with strongly elevated intramarginal concentric ridge, which becomes much thickened, widened and rounded anteriorly and crossed at regular intervals by short equidistant transverse deep grooves in its middle three-fourths, dividing it into 15-16 small subquadrate blocks, outside which the whole margin of the shell is abruptly geniculated and smooth; remainder of interior covered with fine radial striae and vascular markings and having small undefined ovarian areas, with a few small pits on each side close behind the adventitious ridges. Hinge-area narrow, with triangular open delthyrium.

*Dimensions.*—

(BG. 9741.)

	mm.
Length .....	10
Width .....	12

*Horizon and Locality.*—Balclatchie Beds, Balclatchie.

*Remarks.* The single specimen in Mr. Begg's collection from which the above description is drawn up consists of the impression of the interior of a pedicle-valve. It appears to be almost identical with that of *Strophomena planumbona* (Hall) as figured by Foerste (1912, p. 73, pl. viii. fig. 1 E; 1924, p. 117, pl. xii. fig. 1 C), from the Upper Ordovician of the United States and Canada, which is a variable species, and Foerste (1912, pp. 81–87) unites with it as varieties *Str. elongata* James and *Str. subtenta* (Conr.) and describes two new varieties as *gerontica* (1912, p. 87, pl. iv. figs. 2 A–C) and *chambliensis* (1914, p. 260, pl. ii. figs. 4 A, B), but our Girvan specimen agrees best with the type-form.

*Rhynchocamera anceps*, sp. nov. (Pl. III. figs. 4, 4 a.)

Shell transverse, subelliptical, widest across middle. Brachial valve with long umbonal edges diverging at about  $120^\circ$  and extending to middle length of shell; lateral angles rounded; anterior margin broadly curved forwards; umbo small; pointed, incurved; surface of valve strongly convex, trilobed, a median fold arising at about half its length and rapidly increasing in height to the front end, near which it bears three short parallel subequal subangular ribs; the sides of the fold descend steeply to short grooves, widening and deepening anteriorly and separating the depressed but strongly swollen lateral lobes, the left lobe only having a low rounded fold on its inner side arising a short distance in front of the umbo. On each side of the umbo there is a small narrow gently concave undefined crescentic area along the umbonal edges, inclined nearly at right angles to the general surface of the valve. Interior with indistinct subcircular muscle-area about one-fourth length of valve, and a thin median septum extending about half or three-fourths the length of the valve. Surface of valve with 3–4 narrow weak lamellöse concentric growth-ridges on anterior half of lateral lobes.

*Dimensions.*—

(R. Tripp Coll.)

	mm.
Length .....	8.5
Width .....	11.5

*Horizon and Locality.*—Stinchur Limestone, Minunition.

*Remarks.*—We may compare this species with *Camerella varians* Billings, which Schuchert & Cooper (1932, p. 189) put in their new genus *Rhyhocamera*, and which Twenhofel (1938, p. 53, pl. vii. figs. 19–21) describes and figures from the Mingan Islands, remarking on its variability. Only the brachial valve of our one specimen is preserved.

*Plectatrypa shallochensis*, sp. nov.

(Pl. III. fig. 6.)

Shell rounded-subquadrate. Pedicle-valve convex, with a shallow median sinus ill-defined, broadening rapidly to front and having a gently concave or flattened floor carrying 3–4 primary rounded ribs near the umbo, which bifurcate at less than half their length; lateral lobes carrying 5–6 primary ribs of equal size, except the one on each side of the sinus, which is rather thicker: the others divide once somewhat unequally: interspaces nearly as wide as ribs; 2 or 3 strong elevated lamellose concentric growth-ridges, widely spaced, cross the surface of the valve, and there is also a close fine concentric lamellose striation.

*Dimensions.*

(R. Tripp Coll.)

	mm.
Length .....	12
Width.....	14

*Horizon and Locality.*—Dionide Bed, Whitehouse group, Shalloch Mill, Girvan.

*Remarks.*—We may compare this species, which it is only represented in Mr. Tripp's collection by the impression of two pedicle-valves, with *Plectatrypa gaspéensis* Cooper (Schuchert & Cooper, 1930, p. 279, pl. ii. figs. 13–15), from the Upper Ordovician of Percé, Quebec. The sinus is less marked, and the presence of two strong concentric lamellar growth-ridges seem to be the only points of difference. *Pl. imbricata* (Sow.) from the Slade Beds (Reed, 1905, p. 454, pl. xxiii. fig. 16) is closely allied.

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# EXPLANATION OF THE PLATE.

- Fig. 1. *Orthis (Glyptorthis) speciosa*, sp. nov. Pedicle valve,  $\times 5$  (from squeeze). Starfish Bed, Drummuck Group, Ladyburn. [R. Tripp Coll.]
- Fig. 1 a. Ditto. Diagrammatic transverse section of valve near umbo.
- Fig. 2. *Chonetes (Nodevonaria) celtica*, sp. nov. Exterior of brachial valve with hinge-areas of both valves attached,  $\times 5$ . Balclatchie Beds, Balclatchie. [B.G. 9748.]
- Fig. 2 a. Ditto. Diagrammatic transverse section of

- Fig. 3.** *Plectodonta thraivensis* (Reed), var. nov. *divergens*. Internal cast of pedicle-valve.  $\times 2\frac{1}{2}$ . Craighead Limestone, Craighead. [B.G. 9558.]
- Fig. 3 a.** Ditto. Posterior view of same specimen.  $\times 2\frac{1}{2}$ .
- Fig. 4.** *Rhynchocamera anceps*, sp. nov. Brachial valve.  $\times 3$ . Stinchard Limestone, Minunition. [R. Tripp Coll.]
- Fig. 4 a.** Ditto. Anterior view of same specimen.  $\times 3$ .
- Fig. 5.** *Strophomena planumbona* (Hall), var. nov. *girtanensis*. Impression of the interior of a pedicle valve.  $\times 4$ . Balclatchie Beds, Balclatchie. [B.G. 9741.]
- Fig. 6.** *Plectatrypa shallochensis*, sp. nov. Pedicle-valve.  $\times 2\frac{1}{2}$  (from squeeze). Dionide bed, Whitehouse Group, Shalloch Mill. [R. Tripp Coll.]

XXV. *Stray Notes on Mallophaga*. - VI.

By G. H. E. HOPKINS, M.A.\*

27. "*Stray Notes on Mallophaga*.— V." A Correction.

A misprint on p. 118 of the last instalment of these notes (Hopkins, 1942) makes nonsense of my statement. At the end of the first line, "now" should be "not."

28. *The Host of Falcolipeurus africanus* Bedford.

In a previous note in this series (Hopkins, 1941 *b*, pp. 292–293) I stated that the host of *Falcolipeurus lineatus* Bedford is *Pseudogyps africanus*, and suggested that the host of *F. africanus* Bedf. might be *Gyps coprotheres* (J. R. Forster), but certainty was unattainable because I had not seen any material from the latter host. Among a number of specimens sent to me for determination from the South African Museum, Cape Town, there is a good series of a *Falcolipeurus* from *Gyps coprotheres*; these specimens prove my suggestion to be correct, for they are *F. africanus* Bedford.

How the extraordinary double error arose by which the parasite of *Gyps coprotheres* was described as that of *Pseudogyps africanus* and *vice versa* cannot now be ascertained, but this is of little importance now that the error is corrected.

29. *The Name Strongylocotes tinnami* (Rudow).

Rudow (1870, p. 473) described a "*Nirmus tinnami*" from "*Tinnamus bannaquira*," at that date called *Tinamus boraquira*; his misspelling of the name of the

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host caused him to misspell that of the parasite also. Giebel (1874, p. 181) corrected the spelling to *tinami*, and the few authors who mentioned the name at all used Giebel's corrected version until Carriker (1936, p. 93) reverted to Rudow's original mistake. In taking this course Carriker undoubtedly believed himself to be acting in accordance with Article 19 of the International Rules of Zoological Nomenclature.

Dobell (1939, p. 256) points out, in a paper for which all zoologists should be grateful, that the English translation of Article 19 of the Rules is incorrect, and that the original and authoritative version authorizes the correction of "une faute de transcription, d'orthographe ou d'impression." In other words errors of transcription, spelling-mistakes and typographical errors may (and should) be corrected, though the error must be evident in the original publication.

Now "*tinnami*" is both an error of transcription and a spelling-mistake; since there is no such bird-genus as *Tinnamus* it is quite evident that Rudow copied the name of the host wrongly, misspelling it. In these circumstances the correct name of the insect is *Strongylocotes tinami* (Rudow), not *tinnami*.

### 30. *The identity of Læmobothrion lathrobium Kolenati.*

Kolenati (1846, p. 139, pl. 19, f. 6) described and figured as *Læmobothrion lathrobium* a species "sub lapidibus ad amnes Transcaucasiae, in nemoribus sub foliis delapsis et in *Vulture cinereo*, *Falcone buteo*, *Carbo pygmaeo*, *Mergo merganser*, *albello*, *Anate boschas*, *rutila* semper singulare a me observatum." Subsequent authors merely mention the species, without adding anything to our knowledge of it, except that Piaget (1880, p. 587) remarks, very truly, that a species of *Mallophaga* found under stones and fallen leaves, on birds of prey and on water-birds must be a strange insect. Harrison (1916, p. 64) rather adds to the difficulties by giving *Vultur* sp. as the sole host.

Fortunately Kolenati's figure is not at all bad, and it shows a quite unmistakable female *Eulæmobothrion*. It seems practically certain that Kolenati's specimens from the vulture and buzzard belonged to *Læmobothrion*, s. str., so that his series must have been composite; in these circumstances the reasonable attitude is to accept

the figure as a restriction. We can, therefore, discard the vulture and buzzard as possible hosts for *Eulæmobothrion lathrobium*, but this does not get us very much further because none of the water-birds mentioned by Kolenati is normally infested by this genus. *Eulæmobothrion*, however, is only known to occur on two species of birds likely to be found in Transcaucasia: *Fulica atra* and *Gallinula chloropus*. The latter species is the host of *Eulæmobothrion chloropodis* (Schränk), which has never been sufficiently described, but Schränk's description does not fit Kolenati's species, nor does Piaget's description of *E. emarginatum*, from a subspecies of *Gallinula chloropus*. We are left, therefore, with a strong probability that the true host of *E. lathrobium* was *Fulica atra*, and that *lathrobium* is a synonym of *E. atrum* (Nitzsch). The latter species, also, has never been really satisfactorily described, but Kolenati's figure and description fit the female of this species (figured by Kellogg, 1896, pl. 14, f. 3) very fairly. (Giebel's failure to realize that the two names probably refer to the same species is doubtless due partly to Kolenati's very misleading list of hosts and partly to the fact that Giebel seems only to have known the male of *atrum*.)

Pending re-examination of Kolenati's type, if it still exists, I consider *Eulæmobothrion lathrobium* (Kolenati), 1846, to be a synonym of *E. atrum* (Nitzsch), 1818, and a straggler from *Fulica atra*.

### 31. *The Host of Lipeurus forcipatus Piaget.*

*Lipeurus forcipatus* was described (Piaget, 1885, p. 72, pl. 8, f. 1) from a male found on a skin of *Buceros* (now *Tropicranus*) *albocristatus* in Leyden Museum. In my description of the genus *Buceronirmus*, found on hornbills, I listed (1941 a, p. 43) the known species of *Ischnocera*, which appeared to me to be referable to this genus, but omitted *forcipatus* because it does not exhibit the characters of *Buceronirmus*, and I thought it probably a straggler. This opinion proves to be correct, for on re-examining Piaget's figure I was struck with the resemblance to certain plantain-eater lice, and further investigation showed that *forcipatus* is undoubtedly a *Splendoroffula*.

It is possible, however, to go a little further in identifying the host. I possess specimens of *Splendoroffula* from all the genera of Musophagidæ except *Gallirax* and *Proturacus*, and, as the sole known species of the latter genus was not described until 1923, we can probably rule it out as the host of an insect described in 1885. Furthermore, Piaget's figure shows very clearly the claw-like lateral lobes of the terminal abdominal segment which are so conspicuous a feature in the males of many species of *Splendoroffula*. The lobes shown in Piaget's figure in no way resemble those of the species found on *Corythæola*, *Corythæoides*, *Gymnoschizorhis* and *Musophaga*, but they do very closely agree with the shape of these structures in the species found on *Ruwenzorornis* and *Turacus*. Of these last two genera, *Ruwenzorornis* is not a probable host of *forcipatus* because the single known species was not discovered until 1901. I have not mentioned *Crinifer*, because this genus apparently does not possess a *Splendoroffula*.

Piaget's specimen having been found on a skin of a West African hornbill, there is a strong probability that the true host is a West African plantain-eater, since it is not likely that contamination took place in the Museum and is much more probable that it occurred either when the specimens were collected or when the skins were packed together for transport to Holland. If this suggestion is well-founded we can probably rule out the genus *Gallirax*, because this genus does not occur further west than Uganda. We are left, therefore, with the genus *Turacus*, and the species of this genus in West Africa are *macrorhynchus*, *persa*, *schüttii*, *leucolophus* and *erythrolophus*; the host of *S. forcipata* is not likely to have been the first-named if the record of *Splendoroffula dispar* (Piaget) \* from this host is correct (as it probably is), because *dispar* is very unlike *forcipata* and there is no known instance of the occurrence of two species of *Splendoroffula* on the same host.

To summarise: it is nearly certain that the true host of *Splendoroffula forcipata* (Piaget) is a *Turacus* and very probable that it is *T. persa*, *T. schüttii*, *T. leucolophus* or

\* Harrison's name *distinctum* for this species falls into synonymy, because *dispar* Piaget, 1880, was described as a *Nirmus* and is now in *Pectinopygus*, whereas *Splendoroffula dispar* was described as a *Lipourus*.

*T. erythrolophus*. Beyond this point it is not possible to go until peace causes the type to be again available.

### 32. *The Identity of Heleonomus confusus Ferris.*

Kellogg (1910, p. 53) described as the female of his *Colpocephalum miandrium* a form which differed from the male chiefly by its smaller size and more uniform coloration ("body all over strong opaque brown except transverse pale sutural lines on the abdomen, and a narrow uncoloured median longitudinal line . . . ."). Ferris (1916, p. 307), after examining Kellogg's material of the "female," stated that "One of the two specimens at hand is a male in which the genitalia are very weakly developed," and named this form *Heleonomus confusus*. Bedford (1936, p. 99) sank *confusus* as immature *Heleonomus miandrius* (Kellogg), pointing out that Kellogg's description of the "female" agrees perfectly (with one unimportant exception) with "immature females" of *H. miandrius*. If, as is apparently the case, Bedford used the term "immature" to represent nymphs in this instance,\* his explanation is unsatisfactory, because Ferris definitely remarks on the presence of the male genitalia. Bedford also described the true female of *H. miandrius*.

Believing Bedford to have been wrong, and possessing a large amount of material from *Balearica regulorum gibbericeps*, I searched through this material in an endeavour to find a male which should correspond with *H. confusus*, but in this I was entirely unsuccessful; I did, however, find a specimen which, so I believe, provides a clue to the explanation of the problem. This specimen is a female *H. miandrius* which was killed during the process of moulting its last nymphal skin; the skin is still attached to the insect and shows the markings of *H. confusus*. It seems practically certain that the type of *H. confusus* was an individual which had reached the end of the last nymphal instar and had developed the male genitalia, but was killed just before its final moult; the mention by Ferris of the fact that the genitalia were

\* I suggest that the word "immature" should be dropped with regard to Mallophaga, because different writers (or even the same writer on different occasions) use it with different meanings. The correct terms are "nymphs" for the pre-adult stages and "teneral adults" for adults which have recently cast their last nymphal skin and have not yet attained their full colouring.

"very weakly developed" greatly strengthens this supposition, for this is the condition we would expect to find in a teneral adult.

There is, of course, nothing inherently improbable in the occurrence of two species of one genus on a single host-individual (most crows, for instance, normally possess two species of *Myrsidea*), but in this instance I am convinced that Bedford was right, that *Balearica regulorum gibbericeps* is infested by only one species of *Heleonomus*, and that *H. confusus* Ferris is a synonym of *H. miandrius* (Kellogg). I asked Mr. O. B. Cope of Stanford University if he would be good enough to examine the type of *H. confusus* and check my supposition, but he informs me that the type has unfortunately been mislaid.

33. *The Identities of Nirmus paradoxus Rudow and of Lipeurus alchatae Rudow.*

In his 'Beitrag' (1869, pp. 18 and 36) Rudow described two species of Mallophaga from sandgrouse, both obviously belonging to the genus *Syrnhaptæcus*. *Nirmus paradoxus* (p. 18) is from *Syrnhaptæ paradoxus* and *Pterocles alchata*, and is described as having the head anteriorly broadly rounded and a "grösse" of 0.5 mm.; *Lipeurus alchatae* is from *P. alchata*, and is stated to have a triangular head and a "grösse" of 2 mm.

In Rudow's next paper both *N. paradoxus* and *L. alchatae* have disappeared, but we find (1870, p. 472) a *Nirmus alchatae* which is evidently intended to represent them both, for the main description appears to refer to material from *Pterocles alchata* and there are notes on differences in material from *S. paradoxa*, though the question of the difference in shape of head is completely ignored. It is somewhat amusing to note (cf. Hopkins, 1940, p. 418) that as regards "Grösse" Rudow has split the difference and gives it as 1 mm. The head of *N. alchatae* is described as broad anteriorly, no broader posteriorly, and almost circular in outline, and this description is emphasized by a statement that *N. alchatae* somewhat resembles *N. turmalis* (itself a broad-headed species), but is separable by its broader head. This description is, therefore, primarily an expanded version of that of *N. paradoxus* and not of the triangular-headed

*L. alchatæ*, which is only represented by the name, some of the notes on variation, and to some extent the size. If Rudow had deliberately set out to create confusion he would hardly have needed to alter his methods of procedure.

Giebel (1874, p. 152) redescribes *N. alchatæ* Rud. from four dried specimens received from Rudow: the species is again the round-headed one ("Der Vorderkopf hat einen halbkreisförmigen Umfang") and is, therefore, *alchatæ* Rudow, 1870, not *alchatæ* Rudow, 1869. The hosts are given as "*Pterocles alchata* und *Syrrhaptæ paradoxus* nach Rudow," which suggests that the specimens sent to Giebel by Rudow were without data.

Piaget (1880, p. 165, pl. 13, f. 12) describes and figures, under the name *Nirmus alchatæ* Rud., a species which might very well represent the triangular-headed form which Rudow described in 1869 under the same name, except that it is from *Syrrhaptæ paradoxus*; in view of the known high specificity of the Mallophaga of sandgrouse (except *Syrrhaptæcus brevifrons*), it can hardly have been the same as Rudow's species. It could not possibly represent the round-headed *N. paradoxus*.

Waterston (1928, p. 344, f. 1 a) describes, as *Syrrhaptæcus alchatæ* Rud., a triangular-headed form from *Pterocles a. alchata* and *P. a. caudacutus*, and this may certainly be accepted as *Lipeurus alchatæ* Rudow, 1869, though it is definitely not *Nirmus alchatæ* Rudow, 1870, as stated by Waterston. Similarly Waterston's *Syrrhaptæcus bedfordi* (1928, p. 342, f. 2 b, 9 c) may be accepted as representing Piaget's misidentification of *alchatæ* Rudow, more especially as it is the only species definitely known to occur on *Syrrhaptæ paradoxus*. We are left only with the round-headed species, described in 1870 as having an almost circular head and by Giebel as having a semicircular preantennal region.

There is only one known species on sandgrouse, *Syrrhaptæcus brevifrons* Waterston, which has a strikingly round head, and no other known species which could possibly be described as having a head broader than that of *Otilipeurus turmalis* (Denny), as Rudow states in 1870. As yet *brevifrons* is not known from either *Syrrhaptæ paradoxus* or from *Pterocles alchata*, though it is known from *P. namaquus*, which is closely related to *alchata*. Complete certainty as to the identity of *N. paradoxus*

and *S. brevifrons* must await the obtaining of *brevifrons* from one of the original hosts, and examination of the specimens in the Halle collection, if these are still preserved. But there is at least a very strong probability that they are the same, especially as *brevifrons* is known to occur on several species of sandgrouse (Waterston, p. 340).

The synonymy of the various forms dealt with is as follows :—

*Syrrhaptæcus alchatae* (Rudow), 1869.

*Lipeurus alchatae* Rudow, 'Beitrag,' 1869, p. 36. On *Pterocles alchata*.

*Nirmus alchatae* Rudow, Z. ges. Nat. Wiss. 35, 1870, p. 472. Part: description primarily that of another species.

*Lipeurus alchatae* Rudow, Piaget, 'Pédiculines,' 1880, p. 352. Mentioned as insufficiently described.

*Syrrhaptæcus alchatae* Rudow, Waterston, Proc. Zool. Soc. Lond. 1928, p. 344, f. 1 a. On *Pterocles a. alchata* and *P. a. caudacutus*.

Type-host: *Pterocles a. alchata* Linn.

*Syrrhaptæcus bedfordi* Waterston, 1928.

*Nirmus alchatae* "Rud.", Piaget, 'Pediculines,' 1880, p. 165, pl. 13, f. 12, not *L. alchatae* Rudow, 1869. On *Syrrhaptæ paradoxus*.

*Syrrhaptæcus bedfordi* Waterston, Proc. Zool. Soc. Lond. 1928, p. 342, f. 2 b, 9 c. On *Syrrhaptæ paradoxus*.

Type-host: *Syrrhaptæ paradoxus* (Pallas).

*Syrrhaptæcus paradoxus* (Rudow), 1869.

*Nirmus paradoxus* Rudow, 'Beitrag,' 1869, p. 18. On " *Syrrhaptæ paradoxa* und *Pterocles alchatae*."

*Nirmus alchatae* Rudow, Z. ges. Nat. Wiss. 35, 1870, p. 472. Main part of description.

*Nirmus alchatae* Rudow, Giebel, 'Insecta Epizoa,' 1874, p. 151. Redescription from type-material.

? *Syrrhaptæcus brevifrons* Waterston, Proc. Zool. Soc. Lond. 1928, f. 1 b, 7. On *Pterocles coronatus atratus* (*Eremiector coronatus* from Muscat).

Type-host not established, either *Syrrhaptæ paradoxus* or *Pterocles a. alchata*.

34. *Menopon incisum* Giebel and *Menopon virgo* Giebel.

In 1866 (p. 391) Giebel mentioned a *Menopon cucullare* from *Coracias garrulus*, without description but with a reference to p. 121 of vol. 27 of the Zeitschrift; reference to this earlier paper (Nitzsch, 1866) reveals no mention of parasites of *Coracias*, but the starling-parasite now known as *Myrsidea cucullaris* is briefly described on p. 121 as *Menopon cucullare*. On the next line of the later paper Giebel briefly described a *Menopon incisum*, without mentioning the host. In 1874, Giebel (p. 288) described a *Menopon virgo* from *Coracias garrulus*, giving *M. cucullare* Giebel, 1866, p. 391, as a synonym; *Menopon incisum* does not appear at all, either in the body of the work or in the host-list (pp. vii. xiv.), nor did it appear again in the literature until Harrison listed it in 1916 and suggested the possibility that the host might be *C. garrulus*.

Having obtained a long series of a Menoponid from *Coracias g. garrulus*, I compared my specimens with Giebel's descriptions of *M. incisum* and *M. virgo* and found them to be in very fair agreement with both, particularly in regard to the more diagnostic characters which he mentions.

Complete certainty on the matter can only be attained when the Nitzsch collection of Mallophaga again becomes accessible, but I am convinced that *incisum* and *virgo* are two names for the same insect. What probably happened is that Giebel intended at first to call the insect *cucullare* and later decided to call it *incisum*; he listed it under the former name and then described it under the latter. In 1874 he had realized that the name *cucullare* was preoccupied, but completely overlooked the fact that he had described the species as *incisum*, so he redescribed it as *virgo*. If I am right it is likely that Nitzsch's collection will be found not to contain any specimens labelled *Menopon incisum*, the type-series of this species being labelled *M. virgo*.

The species will probably require a new genus, but is not far removed from *Allomenopon*; for the present I prefer to call it *Allomenopon incisum* (Giebel).

35. *The Host of Cummingsia maculata* Ferris.

Ferris (1922, p. 83) described *Cummingsia maculata* from three males and a female obtained from a skin of



*Cænolestes* sp. preserved in the United States National Museum. As Ferris gave the data of the skin I wrote to Dr. Remington Kellogg, Curator of the Division of Mammals in the Museum, and asked him if it were possible to trace this skin. He most kindly informs me that the skin has been found and that it is a specimen of *Cænolestes incae*.

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**XXVI.**—*Additions to the Marine Fauna of the Scott Head Region.* By H. C. GILSON, M.A., F. S. J. HOLLICK, Ph.D., and C. F. A. PANTIN, Sc.D., F.R.S. (From the Zoological Laboratory, Cambridge.)

COMPARED with that of the west country the marine shore fauna of East Anglia seems poor in variety, even if it is rich in numbers of individuals. But the fauna is nevertheless of interest because the physiographic conditions along parts of the coast are unlike those in the rest of Britain. Unfortunately, our knowledge of it is very limited even for particular localities. A survey of the Invertebrate fauna of the Scott Head region has been made by Serventy (1934), but visits to this region by

members of the Cambridge Zoological Laboratory suggested that his lists were far from complete. Accordingly a party of 15 members of the laboratory visited the region on June 1st, 1938, and made an extensive collection.

Serventy records 64 species in the area, about half of which were found by us. But no less than 42 of the species we found were not recorded by Serventy. These figures show how much is to be done before we have an adequate knowledge of the fauna even in this locality. And until such knowledge is attained ecological work on this interesting area cannot be attempted.

The most striking feature of the Scolt Head region is the general absence of a firm substratum to which animals can adhere. The extensive mud-flats and sands sometimes contain great numbers of individuals, but the number of species is very small compared with that of a rocky coast with its variety of habitat.

In the few places where the substratum is firm the fauna is very rich. About a mile west of the Brancaster golf course an ancient forest bed of stiff dense clay and peat runs out into the open sea. This is inhabited by a multitude of boring molluscs, and the following lists give only a limited idea of the rich fauna of its crannies and surfaces. Similarly, the breakwater in Burnham Harbour and an old groyne or wreck on the shore opposite Bight Hills have a fairly extensive fauna because of the opportunity they provide for sessile organisms.

Apart from the nature of the substratum the fauna within Brancaster and Burnham Harbours and their creeks is poorer than might be expected. This is partly due to the strong tidal currents in the creeks and to the consequent instability of the surface. The shifting banks of shingle by the Brancaster channel contain nothing, whereas animals are numerous in the sandy muds where movement is less. The effect of currents and movement of the substratum is strongest at the lowest levels of the beaches, so that this region, which in the open seashore is the richest, is here the poorest in its fauna. This is very clear if the fauna of the forest bed clay beyond Brancaster golf course is compared with the fauna of the outcrop of the same formation at the bottom of the channel in Brancaster Harbour. The fauna of the latter is much poorer. There are many areas of this

clay where large colonies of boring Lamellibranchs have been recently overwhelmed by sand and shingle or have again been exposed, leaving their dead shells *in situ*.

Instability may not be the only factor in reducing the fauna, especially in the mud regions, where less shifting takes place. Here the large amount of detritus in the water may deter filter feeding animals, and the composition of the mud itself may be unfavourable to burrowers.

While the lower levels tend to be poor, the sandy muds and gravels about mid-tide level have a rich and widespread fauna, particularly in Polychæte worms.

Collections were made at the following stations. The small letters show the abbreviation by which each station is represented in the list of species. The numbers of species collected at each station are given.

(a) *Open Sea Forest Bed*: dense clay and peat about 1 mile west of Brancaster golf course. 22 spp.

(b) *Brancaster Harbour Forest Bed*: dense clay and peat on south side of Brancaster harbour channel. 10 spp.

(c) *Opposite Cocker Bight*: sand with gravel on south side of Brancaster harbour channel. 11 spp.

(d) *Beach Point*: sand with gravel and pools left by the tide. 8 spp.

(e) *Cocker Bight*: a thin surface layer of soft mud overlying firm sandy mud: large areas covered with *Zostera nana* (Roth). 16 spp.

(f) *Open Sandy Beach*: beyond Bight Hills. 6 spp.

(g) *Old Groyne or Wreck*: in pool on open sandy beach. 21 spp.

(h) *Burnham Harbour Sand Flats*: characterized by *Enteromorpha* and *Lanice*. 12 spp.

(i) *Burnham Harbour Breakwater*: 19 spp.

(j) *Gren Hill Arenicola Zone*: firm sand mixed with mud. 5 spp.

(k) *Black Mud, Overy*: main channel between Overy and Gren Hill. 3 spp.

(l) *Marshpans, Overy*: in salt marsh. 6 spp.

(m) *Norton Creek*: mud and sand. 19 spp.

In identifying the species the nomenclature of the 'Plymouth Fauna List' (1931) has been followed throughout. Where the species are not recorded at Plymouth they have been named in accordance with the authorities quoted in the Plymouth list.

Apart from the large number of new species, comparison of this list with that of Serventy reveals fair agreement except among the Polychæta and the Amphipoda. Of Polychæta, in the genus *Nephtys*, Serventy records only *N. caeca*. We found in addition *N. hombergi* and *N. cirrosa* in numerous localities. Among the Spionidæ Serventy records *Spio filicornis* in quantity. This we have not found, while we found numerous *Nerine cirratulus* not recorded by Serventy. The Polychæte fauna is extensive, as Serventy has pointed out, and probably neither his list nor ours approaches completeness. This is also true of the Amphipoda. Serventy records 14 species: we found 7 species, of which 4 were not recorded by Serventy.

The collections are at Cambridge.

PORIFERA, DEMOSPONGIARIA. Fam. Axinellidæ: *Halichondria panicea* (Pallas), a, c, i, m.

CŒLENTERATA, HYDROZOA. Fam. Campanulariidæ: *Clytia johnstoni* (Alder), g; *Obelia geniculata* (L.), g; *Obelia flabellata* Hincks, a, b, g, i; *Laomedea* (= *Obelia*) *gelatinosa* (Pallas), b, g; *Laomedea* (= *Campanularia*) *flexuosa* Hincks, i. Fam. Sertulariidæ: *Sertularia cupressina* (= *argentea*) (L.), g, i. Fam. Plumulariidæ: *Kirchenpaueria* (= *Plumularia*) *pinnata* (L.), a, b, g.

ANNELIDA, POLYCHAETA. Fam. Aphroditidæ: *Lepidonotus squamatus* (L.), g; *Harmothoe lunulata* (Delle Chiaje) (associated with *Lanice*), m. Fam. Phyllodocidæ: *Phyllodoce maculata* (L.) (with egg capsules), g, h; *Eulalia viridis* (O. F. Müller), h, i. Fam. Nereidæ: *Nereis pelagica* L. (often in old *Lanice* tubes), c, m; *Nereis diversicolor* O. F. Müller, k, l; *Nereis succinea* (Leuckart), a; *Nereis virens* (Sars), a; *Perinereis cultrifera* (Grube), b. Fam. Nephtyidæ: *Nephtys caeca* (O. F. Müller), h; *Nephtys hombergi* Lamarck, a, c, d, f, j, k, m; *Nephtys cirrosa* Ehlers, a, c, f, h, m. Fam. Ariciidæ: *Scoloplos armiger* (O. F. Müller), c, f, g, m.

Fam. Spionidæ : *Nerine cirratulus* (Delle Chiaje), c, h.  
 Fam. Cirratulidæ : *Audouinia tentaculata* (Montagu),  
 h, m. Fam. Arenicolidæ : *Arenicola marina* L., c, e, j, k,  
 l, m. Fam. Terebellidæ : *Amphitrite rubra* (Risso), a ;  
*Lanice conchilega* (Pallas), a, b, d, g, h, m. Fam. Serpu-  
 lidæ : *Pomatoceros triqueter* (L.), a, j.

CRUSTACEA, CIRRIPIEDIA. Fam. Balanidæ : *Balanus*  
*balanoides* (L.), i. ISOPODA. Fam. Anthuridæ : *Cyathura*  
*carinata* (Norman and Stebbing), g. Fam. Idotheidæ :  
*Idothea viridis* (Slabber), c, e, h, i. Fam. Janiridæ :  
*Jæra marina* (Fabricius), i. AMPHIPODA. Fam. Haustori-  
 idæ : *Urothæ pulchella* (A. Costa), f ; *Bathyporeia pelagica*  
 Bate, d. Fam. Oediceroidæ : *Pontocrates arenarius*  
 (Bate), d. Fam. Calliopiidæ : *Calliopius rathkei* (Zaddach),  
 b. Fam. Gammaridæ : *Gammarus locusta* (L.), b, c, d, e,  
 g, h, m. Fam. Talitridæ : *Orchestia mediterranea* A. Costa,  
 l. Fam. Corophiidæ : *Corophium volutator* (Pallas), l.  
 SCHIZOPODA. Fam. Mysidæ : *Praunus flexuosus* (Müller),  
 e, m ; *Schistomysis ornata* (G. O. Sars), e. DECAPODA.  
 Fam. Palæmonidæ : *Leander squilla* (L.), g, i, m. Fam.  
 Crangonidæ : *Crangon vulgaris* L., c, e, g, h, m. Fam.  
 Paguridæ : *Eupagurus bernhardus* (L.), a, b, g, i, m.  
 Fam. Portunidæ : *Portunus arcuatus* Leach, d ; *Carcinus*  
*mænas* (Pennant), a, e, g, h, i, l, m. Fam. Maiidæ :  
*Hyas araneus* (L.), g.

MOLLUSCA, PLACOPHORA. Fam. Lepidochitonidæ :  
*Lepidochiton cinereus* (L.), d, e, i. PELECYPODA. Fam.  
 Mytilidæ : *Mytilus edulis* L., i. Fam. Leptonidæ : *Kellia*  
*suborbicularis* (Montagu), a. Fam. Tellinidæ : *Macoma*  
*balthica* (L.), j, m. Fam. Scrobiculariidae : *Scrobicularia*  
*plana* (da Costa), l, m. Fam. Veneridæ : *Paphia* (= *Tapes*)  
*pullastra* (Montagu), a. Fam. Cardiidæ : *Cardium edule*  
 L., d, e, m. Fam. Myidæ : *Mya arenaria* L., m. Fam.  
 Solenidæ : *Ensis siliqua* (L.), f. Fam. Pholadidæ :  
*Pholas candida* L., a, b ; *Pholas crispata* L., a. GASTRO-  
 PODA. Fam. Littorinidæ : *Littorina littoralis* (= *obtusata*)  
 (L.), i ; *Littorina rudis* (= *saxatilis*) (Maton), e, i ; *Lit-*  
*torina littorea* (L.), j. Fam. Assimineidæ : *Hydrobia*  
*ulvæ* (Pennant), e. Fam. Scaphandridæ : *Cylichna*  
*obtusata* Montagu, e. Fam. Iduliidæ : *Idulia coronata*  
 (Gmelin), g. Fam. Doridigitatidæ : *Archidoris britannica*  
 (Johnston), g.

POLYZOA, ECTOPROCTA. Fam. Cellulariidae: *Scrupocellaria scrupea* Busk, g. Fam. Membraniporidae: *Membranipora pilosa* (L.), i, l. Fam. Alcyonidiidae: *Alcyonidium gelatinosum* (L.), a.

ECHINODERMATA, ASTEROIDEA. Fam. Asteriidae: *Asterias rubens* L., a, c, h, i. OPHIUROIDEA. Fam. Ophiotrichidae: *Ophiotrix fragilis* (Abilgaard), a, b, f. Fam. Ophiolepidae: *Ophiura albida* Forbes, a.

TUNICATA, ASCIDIACEA. Fam. Botryllidae: *Botrylloides leachi* Savigny, a, g. Fam. Didemnidae: *Didemnum gelatinosum* Milne-Edwards, i.

PISCES, TELEOSTEI. Fam. Anguillidae: *Anguilla vulgaris* Turton, a. Fam. Gasterosteidae: *Gasterosteus aculeatus* L., e. Fam. Syngnathidae: *Syngnathus acus* L., e. Fam. Ammodytidae: *Ammodytes tobianus* Lesauvage, e. Fam. Blenniidae: *Zoarces viviparus* Cuvier, m; *Centronotus gunnellus* (L.), i. Fam. Gobiidae: *Gobius minutus* (Pallas), e.

We wish to thank Mr. G. M. Spooner of the Marine Biological Laboratory, Plymouth, who kindly identified the Amphipoda, and Dr. N. Millott of Manchester University, who helped to check many identifications.

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XXVII.—*An Adult Specimen of Diretmus (Berycomorphi).*  
 By DR. K. H. BARNARD (South African Museum) and  
 DR. C. VON BONDE (Director of Fisheries, Union of  
 South Africa).

EARLY in December, 1943, commercial trawling operations in 170-200 fathoms off the west coast of the Cape Peninsula brought to light some interesting deep-sea fishes. Two of these were brought to the Museum: one was *Echiostoma tanneri*, already recorded (Barnard, 1937),

but the other was *Lampadena chavesi* Collett, not hitherto recorded from South African waters.

Other fishes sent to Dr. von Bonde included another *E. tanneri*, two *Epigonus telescopus*, and the remarkable fish which is the subject of this note. Owing to pressure of work Dr. von Bonde suggested that Dr. Barnard draw up the description; the latter author is therefore responsible for the following description and figure.

The specimen appears to be the first recorded adult of *Diretmus argenteus*. The largest hitherto recorded specimen is the type,  $3\frac{8}{10}$  inches in length, described by Johnson from Madeira; the smallest specimens (11 mm.) have been recorded by Parr, and intermediate sizes by other authors.

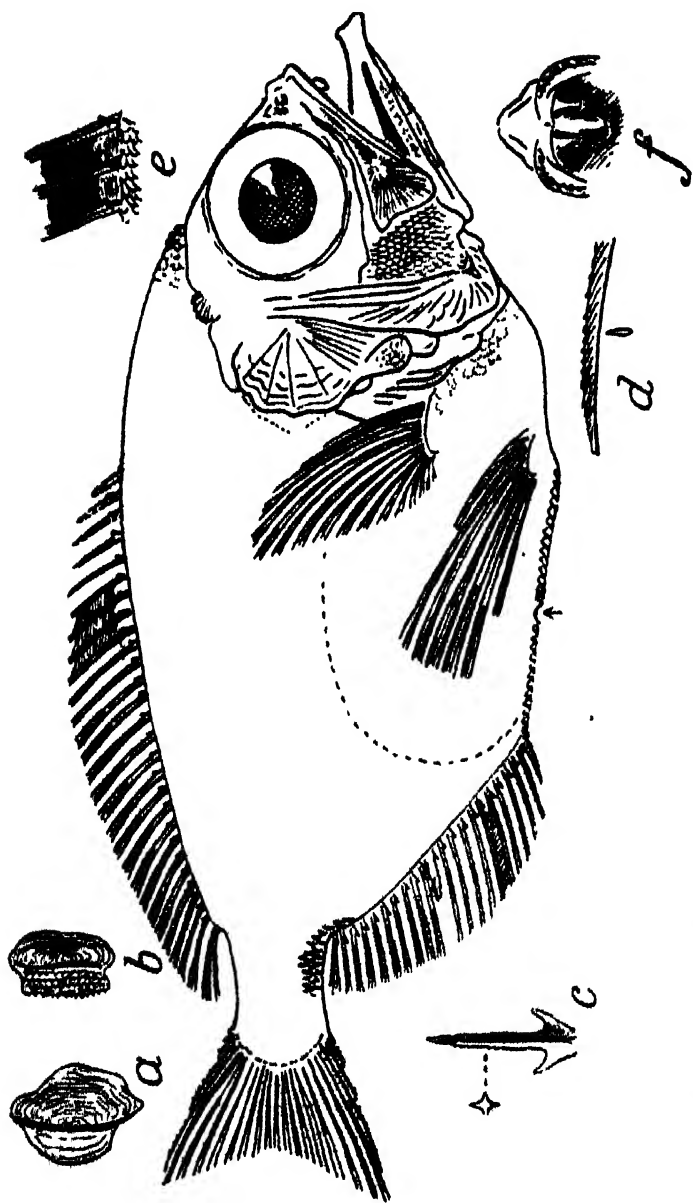
The species has been recorded from the North Atlantic (eastern and western regions), west coast of New Zealand, S.E. Australia, Arabian Sea, and South Atlantic. The last-mentioned record is due to the 'Discovery' investigations, and one of the 'Discovery' localities (approximately 34° S. 16° E.) is within the South African region.

### *Diretmus argenteus* Johnson.

- 1863. Johnson, Proc. Zool. Soc. Lond. p. 403, pl. xxxvi. fig. 1.
- 1879. Campbell, Trans. N.Z. Inst. xi. p. 298, fig. (*Discus aureus*).
- 1887. Günther, Rep. H.M.S. 'Challenger,' xxii. p. 45.
- 1909. McCulloch, Rec. Austral. Mus. vii. p. 320.
- 1911. Zugmayer, Res. Sci. Camp. Monaco, fasc. 35, p. 107, pl. v. fig. 7.
- 1919. Roule, *ibid.* fasc. 52, p. 52.
- 1921. Roule & Angel, C. R. Ac. Sc. Paris, clxxii. p. 1207 (classification) [not seen].
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- 1933. *Id.* *ibid.* fasc. 86, p. 83 (locality records).
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- 1936. Fowler, Bull. Amer. Mus. Nat. Hist. lxx. p. 540, fig. 255 (after Zugmayer).
- 1939. Norman, John Murray Exp. vii. p. 54.

Body oblong, length 370 mm. to end of caudal peduncle, compressed, greatest thickness 45 mm. in shoulder region, 55 mm. in upper part of operculum behind eye. Breast bluntly ridged, but flat between pelvics. Depth approx. 170 mm.,  $2\frac{1}{2}$  in length without caudal, length of head nearly 3 in length without caudal. Eye about

2½ in length of head (excluding a possible skinny flap on hind margin of operculum). Interorbital not quite 3 in eye-diameter, but snout, orbit, and operculum much abraded.



*Diretmus argenteus* Johnson. Adult, to show general shape, in parts semidiagrammatic owing to mutilations; pelvic fin raised to show origin of belly-scutes; dotted lines show extent of abdominal cavity, a probable skinny flap on hind edge of opercle, and the forward extent of the scales on breast and interorbital. *a*, scale from axil of pectoral fin; *b*, scale from lower part of caudal peduncle; *c*, anterior view of an anal (or dorsal) spine; *d*, spine of the pelvic fin; *e*, two "windrows" in the dorsal fin-membrane; *f*, front view (slightly from below) of the maxillary "fangs" and the ridged vomer.

A band of small, conical, incurved teeth on lower jaw and maxilla, narrowing posteriorly. Vomer forming a prominent, bluntly ridged knob; vomer and palatine



without teeth. Inner processes of maxilla prominent, bluntly pointed. Tongue very short, smooth. Bones of operculum radiately ribbed and striate, striæ spinulose or rough, cutaneous covering (if any) abraded; torn remnants of skin on hind margin. Lower jaw ribbed, striate, rough with minute spinules.

Branchiostegals 9, on the right side the four lower ones flattened, then a gap apparently due to injury, then 5 flattened ones, on the left side the two lowest are thin and feeble, followed by 7 flattened ones. Gill-membranes free from isthmus. Gill-rakers 7+11 or 12 on first arch, the longest longer than the longest gill-filaments; pseudo-branchia well developed, a slit behind 4th arch.

Vent midway between pelvics and anal fin.

D 28, the anterior ones spiniform, the posterior ones appearing segmented, asperities covering all the rays, from about the 10th the tips appear to be bifurcate; each with a basal spine on each side, and in cross-section diamond-shaped; 1st about half length of 2nd, which is  $\frac{2}{3}$  the 3rd, the longest nearly equals eye-diameter, but tips of all broken. Membrane very delicate and intact only in two or three interradi al spaces; especially delicate at base, but the semicircular "windows" are actually due to scarcity of pigment, not to absence of membrane.

A 23, similar in structure to dorsal, 12th and 13th rays mutilated, half normal length and apically fused; posterior 10 rays branched (bifurcate); interradi al membrane where preserved similar to dorsal.

P 17, length about  $\frac{2}{3}$  length of head, 1st ray feeble, very slightly roughened; segmentation of other rays marked by small asperities.

V i. 6, spine broken but apparently about  $\frac{2}{3}$  or perhaps  $\frac{1}{2}$  eye-diameter, compressed, obliquely striate, some of the striæ ending in spinules on the sharp anterior edge; longest rays extending almost to origin of anal; segmentation of rays marked on outer (ventral) surface by small asperities.

C 5+19+4, the segmentation becoming slightly roughened on the outer rays, the short supporting upper and lower rays particularly rough.

Scales rubbed off except a few in the axils of the pectorals, and along edge of shoulder-girdle where they have been protected, and a patch on lower part of caudal

peduncle. The former are cycloid, but those on the peduncle are strongly ctenoid. One or two scales near the bases of the posterior half-dozen anal rays also ctenoid, likewise a few on upper part of caudal peduncle at base of last dorsal ray. Approximately 85 scale-pockets between edge of pectoral arch and bases of caudal rays, about 30 around caudal peduncle, 12 horizontal and 14-15 vertical rows on cheek. Interorbital scaling beginning in vertical from posterior third of eye, the anterior scales (which alone remain) being strongly keeled.

Abdominal scutes absent in front of pelvis; 1st below 5th pelvic ray, 14 to the vent, and 12 between vent and anal; strongly ribbed, the ribs ending in short spines. One or two of the scales in the row immediately above the scutes are present and they also are cycloid, with 2 or 3 ribs in lower half.

Body-cavity extending to above 1st anal spine. Air-bladder well developed. Pyloric cæca apparently 5 (not well preserved). Gonads lying behind digestive organs, spent, but containing half-a-dozen eggs, approximately 2 mm. in diameter.

Total length 405 mm. Colour: body and cheeks dull bluish, bony parts of head and jaws brownish-black, with indications of silvery reflections on opercular bones; all fins blackish; buccal and branchial cavities, branchiostegal membranes, and peritoneal lining purplish-black.

The interradiat "windows" in the dorsal and anal fins have been mentioned by Campbell, Zugmayer, Roule and Angel, and have been supposed to be due to absence of the membrane; this is shown to be incorrect. But the most remarkable feature of this specimen is the position of the vent, midway between the pelvis and the anal, with scutes both in front of and behind it. This may be due to malformation, but there is no evidence to support the suggestion.

The specimen has been deposited in the South African Museum.

XXVIII.—*Additional Species of Microdon in the British Museum (Natural History)*. By FRANK M. HULL, University Mississippi.

A NUMBER of species of *Microdon* were described in 1943 from a miscellaneous collection of Syrphids submitted by the British Museum (Natural History) in 1936. This paper appeared in the *Annals & Magazine of Natural History* (s. 11. vol. x. p. 702), and studies of other genera from this collection have appeared from time to time. This paper describes the remainder of the new forms in the genus *Microdon*. The types will be deposited in the British Museum (Natural History).

*Chrysodimyia lazuli*, sp. n.

Related to *chrysidiformis* Hull, the abdomen is broader and wider : but the punctures more deep and coarse.

*Female*. Length 8 mm. excluding antennæ : antennæ 2.3 mm. : wing 8 mm.

*Head* : hemispherical, barely wider than the thorax : the very tumid, rather sharp-edged and shelving upper occiput together with the vertex, the front and face are all brilliant shining, metallic greenish blue with deep heavy punctures. The pile of the vertex is black, quite sparse and erect, that of the front obscure owing to considerable mold. The eyes are thickly and moderately long white pilose over their whole surface. The face is rather narrowed on the lower portion as viewed from the front : the upper front below the ocelli is about the same width as the lower part of the face. The face is quite convex, as much so upon the upper half as upon the lower half, its pile appressed and tolerably sparse and pale shining yellow. There appears to be a very narrow, obscure, non-punctate, bare mid-line of the same colour as the face. The antennæ are elongate, the third segment as long as the first two segments and nearly three times as thick as the first ; the first segment, except for the narrow apex, is blackish above and light reddish brown below ; the remaining two joints are greyish black : the arista is much shorter than third joint, the latter ends somewhat truncate. *Thorax* : broad and short and actually broader than long ; it is wholly deep, brilliant blue, shining, with sparse deep punctures ; the pile is sparse and black and strongly appressed. The scutellum is thick, of the same colour as the thorax, similarly punctate with a

pair of well-developed, greenish spines set almost as far apart as the length of the scutellum. The area between the spines has the merest suggestion of a concavity. The surface pile of the scutellum is pale as well as the scant marginal pile. There are a few pale hairs on the extreme posterior part of the mesonotum. The pleuræ are brilliant, shining blue; the squamæ are yellowish white with yellowish fringes; halteres brownish yellow. *Abdomen*: thick and compact, widest basally: the second segment is wider than the thorax and wholly brilliant bluish green, covered everywhere with very large deep punctures in which is set the pale, semi-appressed, shining, setaceous pile. There is a small patch of dark hairs in the middle of the second segment posteriorly. The sides of the fused third and fourth segment and to a lesser extent of the second are turned down. The posterior corners of the second segment lack the sharp angles often present in some species of *Microdon*. The first segment is flattened, obtusely triangular, fused with the second segment, and has shallow, transverse ridges or grooves in addition to its punctures: the line of junction with the second segment forms a wide, depressed, V-shaped figure. The posterior corners of the second segment strongly overlap the anterior corners of the third, at which point the abdomen is turned downward. At the base of the second segment ventrally, there is on each side, a short blunt spur. *Legs*: the femora and tibiæ are bright shining green, the latter apparently reddish brown in ground-colour, but largely obscured. The tarsi are brownish, the terminal joints a little lighter and, together with the tibiæ, obscured by the thick, flat, pale, shining pile. The pile of the legs is everywhere pale. *Wings*: tinged with brown; a strong stigmal cross-vein is present; the second longitudinal vein ends at right angles after an almost rectangular bend. The straight first longitudinal vein ends acutely. The sub-apical cross-vein practically straight, ending at right angles to the last section of the third vein. The posterior corner of the first posterior cell has no spur, is almost square, but is slightly rounded to an outward curve of the last section of the fourth longitudinal vein. Vena spuria well developed.

*Holotype*: a female. [Amazons] Villa Nova (H. W. Bates), 55: 37.

*Microdon aureomagnifica*, sp. n.

A blackish-brown species with thick golden scabrous pile up on the occiput; similar pilose fascia upon the thorax and

abdomen ; second abdominal segment light red. Related to *rugosus* Bezzi.

*Male*.—Length 11 mm. excluding antennæ, antennæ nearly 3 mm. ; wings 7 mm.

*Head* : a little wider than the thorax and hemispherical except for the ventral bulging of the face. The ground-colour is visible only in the middle of the very wide vertex in the equilateral triangle about the ocelli ; there is a similar transverse striate area above the antennæ which is confluent with the ocellar area ; the area narrowly all around the antennæ and in a narrow median, bare vitta on the lower two-thirds of the face, all of which areas are dark, shining, chestnut-brown. The broad, upper part of the vertex above the ocelli is quite rugose and short, appressed, black pilose. This area is somewhat swollen above the top of eyes. It is margined with appressed, brilliant, golden, scalose pile, which is everywhere directed inward. The occiput is wholly golden scalose pilose. The front is broad, the eyes being angulated. The front across from the nearest approach to the eyes is divided by a groove and above it is golden pile, directed outward and then upward, beginning at the mid-line ; below the groove the pile is directed outward and downward from the mid-line. The side of the face, continuous with that of the front, is densely brilliant, golden, scalose pilose. The face in profile is evenly rounded, but retreats more rapidly on the lower third. The antennæ are elongate, the first and the second segments almost as long as the third segment. All three segments are light brownish red. The second segment is about one-fifth as long as the first. The arista is rather short and thickish, and light coloured. The bare eyes have a waxy surface. *Thorax* : densely appressed, black setate, the setæ proceeding from micro-tubercles. On either side of the mid-line, widely separated, there is an obscure vitta composed of just a few isolated golden scales ; these scales appear to flow into two, short transverse patches of similar scales that lie on either side of the mid-line just before the scutellum. The lateral margin of the mesonotum before and behind, including the posterior calli, the broad anterior margin of the mesonotum, the humeri, the propleura and the mesopleura continuously, the sternopleura and upper pteropleura, are all densely, golden, scalose pilose. The scutellum has large black setæ with broad patches of gold pile which are diagonally directed from the corners over the margin to meet in the

mid-line. Squamæ white ; halteres orange. *Abdomen* : longer than the thorax and broadest at the end of the second segment, which is considerably wider than the first ; it tapers from the second segment, gradually down to the end of the fourth, which ends in the very wide, pale, brownish-orange hypopygium. The first segment is chiefly black ; the second segment is wholly light brownish red ; the pile on the posterior margin is scalose and silvery, on the basal half it is more blackish microsetate and appressed. The third segment is dark brown, almost black and quite black upon the sides ; beginning at the anterior corners there is a broad, diagonal band of thick, appressed, pale, brassy, scalose pile, which, however, does not quite reach the posterior corners and fails by much to cover the basal corners of the segment : very little of this band is visible from above because of the segment being strongly curved downward. However, the third segment has a spot of similar pale pile which is visible from above and is widely separated on either side upon the posterior third of the segment ; it extends broadly on to the posterior margin and it is continuous with a diagonal, large, triangle of pile on the basal corners of the fourth segment which reaches to the apex of the fourth segment and which triangle almost fills out the anterior corners of the fourth segment. Finally, there is upon the top of the subcylindrical fourth segment, beginning not far from the anterior margin, an elongate, widely separated, wide but linear stripe of the pale brassy pile, which reaches broadly on the posterior margin of the segment and becoming wider as it proceeds posteriorly and almost unites with the more lateral, diagonal stripe. This middle pair of stripes is composed of pile which is directed, like currents, towards the mid-line, and meeting in the mid-line it turns directly posteriorly. The fourth segment is like the third, chiefly black, a little reddish on the terminal portion and where not covered with pale pile it is black setate. *Legs* : wholly light brownish orange, the coxæ a little darker, the tibiæ, tarsi and at least the hind femora with ground-colour obscured in certain lights by dense, silvery, scalose pile. *Wings* : strongly suffused with brown which is evenly distributed ; there is a heavy stigmal cross-vein. The stigmal cell is not darker than the remainder of the wing. The subapical cross-vein is recurrent ; the posterior, outer angle of the cell is more or less rounded and without trace of spur.

*Holotype*: a male. Belgian Congo, Elizabethville, Nov. 1925 (*Ch. Seydel*), British Museum, 1927 : 253.

*Microdon aurifascia*, sp. n.

Belongs to the *bidens* group. The thorax and abdomen are chiefly blackish. All but a little of the second segment and the whole of the hypopygium light ochraceous. Wings grey, the anterior border orange.

*Male*. Length 13 mm. ; antennæ 3·5 : wing 9·3 mm.

*Head*: hemispherical, the eyes moderately separated with a shallow, non-grooved depression across the front at their nearest approach, the vertex is dully shining black, the ocelli set upon a slightly raised area: the pile, in a transverse fascia across the ocelli from eye to eye, is erect and black. The pile behind the ocelli and on the occiput is pale silky yellow; there is similarly coloured pile across the depression of the front which is divided along the bottom of the depression, the lower half directed downward, the upper half directed upward, but the pile across the front before the antennæ is black. The front has the ground-colour similar to that of the vertex, brownish, bare, and transversely striate just above the antennæ, the face is shining and polished; the cheeks and the extreme upper part of the face and a conspicuous, perfectly straight, vertical, median stripe are shining, chestnut-brown. The remainder of the face, diagonally delimited along a line from the anterior edge of the epistoma to the middle of the face along the eye-margins, is broadly light brownish-yellow. This area is covered with thick, scaly, appressed, deep golden pile. The antennæ are elongate and black, the first segment is somewhat reddish brown along the inner margin basally. The first segment is not quite as long as the third, the second segment a fourth as long as first. *Thorax*: dull, opaque black, thickly short, flat, pale yellow microsetate when viewed in the proper angle. There is a very thin, transverse, sutural stripe and an erect, anterior, marginal band of pile and a similar, broader band of yellowish pile on the posterior margin of the mesonotum. Scutellum obscurely shining blackish, the rim brownish with two, slender, sharp spines set moderately distant. The pile of the scutellum is flat and pale, shining yellow but not conspicuous. Squamæ yellowish white. Halteres brown. *Abdomen*: quite elongate with practically parallel sides as far as the middle of the fourth

segment and only slightly narrower beyond. The third and fourth segments are fused into a long, rounded club, which is thrust sharply downward at the end of the second segment. The first segment is wholly shining black with sparse, yellowish pile on the basal half, that is flat appressed. Viewed posteriorly the posterior margin of the first segment is fluted. The second segment is one and four-fifths wider than long and is a light brownish yellow over most of its area, with a diffused, inverted T of considerable size in the middle, the top of the T resting upon the apex of the segment, the figure reaching the anterior margin in the middle. The whole of the remainder of the abdomen is brownish black, becoming a little more reddish brown in the middle just before the extreme apex: the rounded hypopygium is reddish brown. The pile of the abdomen is everywhere flat appressed, thick, microsetate and shining brassy or golden in appearance. *Legs*: the femora are chiefly black, the apical half of the first and the narrow apices of the others light reddish chestnut. The anterior and middle tibiae on the outer halves are dark brown with median, yellowish brown, semiannulate stripes, their ventral surfaces reddish. The hind tibiae are more or less reddish brown, and darker apically. The tarsi are dark brown, obscured by pale-coloured pile and pollen. The pile of the legs appears to be wholly pale and quite appressed. The hind femora are only moderately thickened, the greatest thickening a little before the middle. *Wings*: tinged with brown, nowhere dark. The anterior basal half, limited by the anterior cross-vein and by the end of the second basal cell but continued apically along the stigmal cell, and along the costa almost to the fusion of the second longitudinal vein, is all light yellow. There is a strong stigmal cross-vein present; the subapical cross-vein is straight, slightly recurrent, the posterior angles of the first and second posterior cells broadly rounded and without trace of spur. Subapical cross-vein ends rectangularly to the last section of the third vein.

*Holotype*: a male. Alto da Serra, Sao Paulo, Brazil (G. E. Bryant), March 12, 1912, British Museum, 1913: 70.

*Microdon tabanoides*, sp. n.

Moderate in size, chocolate-brown in colour. The scutellum unspined, the abdomen somewhat inflated. Related to *macquariensis* Ferguson, but with yellow facial pile, and without the medial blackish stripe upon the abdomen.



*Female*.—Length 13 mm.; third antennal joint missing; wing 10 mm.

*Head*: hemispherical and but little wider than the thorax; the front and vertex are of normal width and not at all conspicuous, the latter is barely raised above the eye-margin; front, vertex and face everywhere shining chestnut-brown; the more or less erect pile is fairly long, thick, black on the vertex and the front, except for a narrow row of golden hairs along the side-margins of the front: the upper part of the front is separated from the vertex and ocelli by a transverse, shallow, arcuate depression, the convex side turned down. Just before the antennae there is a bare, triangular area lighter brown in colour. The pile of the extreme occiput behind the ocelli and all of that of face and cheeks is brassy yellow. The first and second segments of the antennae are short, the second segment about half as long as the first. *Thorax*: dark shining brown, with slight bronze cast: the pile is rather long, more or less erect, thickish, and of mixed black and yellowish hairs, the yellow pile is brightly shining and forms an unmixed transverse band along the dorsal suture and there is similar pile on the mesopleura and sternopleura. The scutellum is light brown, its margin even, without spines. *Abdomen*: elongate, but quite evenly convex, and everywhere light chestnut-brown; it is more or less shining. The base of the abdomen is barely wider than the end of the third segment. The fourth segment is rapidly tapering so that the segment is almost equilateral and triangular, but its anterior margin is rounded anteriorly. The second segment is short, about half as long as the third segment, but has a conspicuous depression in the middle. The second and third segments are subequal. Pile of abdomen chiefly short, sharp, black and appressed, the posterior corners of each of these segments, and the posterior margin on each side almost to the mid-line, are appressed, shining brassy or yellowish pilose. *Legs*: entirely brown, the basal half of all of the femora are dark brown, the remainder of the legs uniformly pale reddish brown or brownish orange. *Wings*: uniformly tinged with light brown, the veins light brownish yellow. There is a stigmal cross-vein present; the stigmal cell is no darker than the remainder of the wing.

*Holotype*: a female. Victoria, Australia, Feb. 5, 1900 (*A. White*), British Museum, 1917: 104.

*Microdon petiolata*, sp. n.

Characterized by the slender subpetiolate abdomen and infuscated wing-veins and reddish brown coloration. Related in general to *variegata* Macquart.

*Female*.—Length 10 mm. without antennæ; wings 6.5 mm.

*Head*: the eyes are widely separated, the face no wider and no narrower than the width of the front at the vertex. The vertex is somewhat swollen, shining black in colour and very much tumid beyond the posterior corners of the eyes. The front has a shining black, raised, median, rounded ridge connecting with the vertical area about the ocelli. On either side of this ridge, obscuring the black ground-colour of the front, are large patches of radiating, fan-shaped areas of flat, scale-like, reddish-golden pile, directed backwards and towards the sides of the eyes. The face is nearly straight in profile, slightly retreating just above the epistoma and shining black in colour, with copious, flat, bright brassy pile. The pile of the vertex behind the ocelli is golden; there is a transverse band of black pile in front of the ocelli. The antennæ have the first two segments dark brown; the third segment is cylindrical, light red, and nearly twice as long as the first two segments; the tip is rounded. The arista is short, not reaching the end of the third joint and much thickened. The pile of the first two segments is black; the antennæ are not as long as the face to epistoma. *Thorax*: dully shining blackish with golden, appressed hair in patches along either side of the scutellum and a transverse band of pile along the transverse suture of the mesonotum, which is directed backwards; all of this pile is more or less confluent with the general, shorter, brassy pile of the thorax. The pleura have longer brassy pile, the scutellum dark brown with golden pile. *Abdomen*: quite slender, the last segments beyond the second developed into a club which is, however, slender and at its widest, which is in the middle, only about twice as wide as the second segment. The second segment is subcylindrical; the first segment is very little wider than the second. The whole of the abdomen is rather light reddish brown, shining, the pile largely black and setaceous except for transverse, post-marginal bands on the third and fourth segments of pale, shining hair, which does not reach the middle of the segment, and some similar hair along the sides and the posterior corners of the second segment. *Legs*: almost wholly light reddish

brown, except that the cicatrices on the hind tibiæ, all of the femora, and tiny spot in the middle of the anterior tibiæ, are black or dark brown. *Wings* : rounded at the tip, greyish, most of the veins broadly and obscurely suffused with brown. The subapical and the post-apical cross-veins, each slightly recurrent, are slightly sinuous : these cross-veins, together with the last section of the third longitudinal vein, the area about the spur from the third longitudinal vein, the extreme end of second longitudinal vein, the area about the small cross-vein, the end of fifth longitudinal vein, the middle cross-vein, the furcation of the second and third longitudinal veins, and the subcostal cell beyond the stigma, are all margined with brown. There is a strong stigmal cross-vein. The posterior corners of the submarginal and the first posterior cells are angular and form an angle less than a right angle ; they have strong spur-veins.

*Holotype* : a female. Tasmania, Mangalore, 22. xi. 1914 (*A. White*), British Museum. 1917 : 104.

*Microdon pictulipennis*, sp. n.

Related to *pictipennis* Macquart. Scutellar spines very small ; wing-pattern extensive and solidly brown over much of the apex.

*Male*.—Length 9 mm. including antennæ ; wings 7 mm.

*Head* : hemispherical, the eyes more closely approximated than usual ; at the closest distance they are separated by a groove at the bottom of a depression. The vertex is feebly shining black and white pilose, small in area and depressed. The face is unusually convex viewed from above and almost straight in profile ; actually it is gently curved and retreating from the top of the face. The epistoma are, therefore, definitely less prominent than the base of the antennæ. The face immediately below the antennæ is considerably bulged out. The antennæ in consequence are attached at the upper part of a shallow, slanting excavation. The ground-colour of the face is shining black with a faint purplish cast ; the narrow eye-margins on the upper two-thirds are brownish yellow, the pile of the face is rather thick and long, downward thrust and a shining whitish. The antennæ are short ; the third segment is as long or barely larger than the first two segments. All of the segments are brown, rather dark. The first segment is about two-and-one-half times as long as the second, its pile black. Eyes bare. *Thorax* : feebly shining black, rather

flattened and black appressed setate : there is a patch of brassy pile above the root of the wings ; there is a distinct, isolated, roundish spot on either side in the middle of the thorax which is especially noticeable when viewed from in front ; also from in front, the anterior border of the mesonotum, the posterior calli and a patch on either side of the extreme posterior margin of the mesonotum, are all covered with this bronze or brassy pile. The scutellum is black, appressed black microsetate, rather high, and set with two very tiny but definite spinæ that are fairly close together and set upon the low rim of the scutellum ; they might almost pass unnoticed. The squamæ are whitish, the halteres orange. *Abdomen* : half again as long as wide ; the general colour is dark brown and in places black. The abdomen is widest on the second and third segments and tapers to the bluntly-rounded fourth segment and hypopygium. The first segment is shining black, short and inconspicuous, the second segment at least five times as wide as its middle length, depressed or excavated basally ; it is transverse striate on the basal two-thirds. The second segment, together with the third segment, are rather dark brown but lighter brown along the base of the third segment and on the sides of both segments. The fourth segment is lighter brown basally, this colour continuing as a narrow, median vittæ, which is connected with the posterior border and which leaves a pattern of two large, blackish lateral areas, one upon each side, the pattern and marking indistinct and obscure. The pile of the abdomen is everywhere flat-appressed ; it is pale brassy scalose on the outer posterior margins of the second segment, broadly all over the posterior two-thirds of the third segment and throughout the dark lateral areas of the fourth segment, but it is everywhere scattered and sparse. There are some sparse, black hairs in the middles of the segments ; there is no long pile upon the margins of the segments except the anterior corners of the second. Ventrally, on the sides of the first segment, there is a small, blackish, white-tipped spine. *Legs* : chiefly light reddish brown, the basal third of the first and second femora is blackish ; the hind femora is slender, the hind basitarsi not greatly enlarged, the tarsal joints, except the basal one, broader than long. *Wings* : nearly hyaline on the basal two-fifths and with a slight greyish cast ; all of the cross-veins are margined with brown and the entire anterior, outer three-fifths of the wing, including the posterior side of

the third longitudinal vein, is continuous with the clouds along the posterior veins and is uniformly dark brown in colour. There is a large, clear spot in the centre of the first posterior cell, a very small clear spot in the basal portion of this cell, and an elongated spot in the posterior part of the second posterior cell. The subapical cross-vein is almost straight; there is a slight inward bend shortly before it joins the third longitudinal vein at right angles. There is a strong spur from the posterior corner of the first posterior cell where the subapical cross-vein bends upward.

*Holotype*: a male, and two *paratype* males. Tasmania, Mangalore, Feb. 7, 1913 (*A. White*), British Museum, 1917: 104.

I fail to indentify this species with the *M. pictipennis* Macq., which Masquart credits from Tasmania. It is described as having "ailes claires: less nervures transversales bordees de noiratre," which scarcely corresponds with the more or less uniformly brown pattern present in the specimens before me.

*Microdon modesticolor*, sp. n.

Somewhat similar to *rugosus* Bezzi, but smaller and characterized by the dull brown to black coloration; the scutellum is unspined, non-marginate, the wings smoky

*Male*.—Length 8 mm.; wing 5 mm.

*Head*: the eyes are bare with waxy lustre; the occiput is tumid behind, the vertex and front and face very dark, shining, chestnut-brown in ground-colour. The pile of the vertex and front is short and black with a few pale hairs intermixed on the front. The eyes are only moderately separated and are angulated, and at their nearest approach are separated by a transverse groove. The face is gently convex, both viewed from above and from the side; it retreats somewhat more rapidly on the lower third, and is covered with sparse, downwardly directed, silvery pile. The antennæ are moderately elongate, the first two segments are dark brown, the third segment black; the total length of the antennæ would scarcely reach to the oral margin. The first segment is a little longer than the second and third combined, and is about three times as long as the second segment, second segment about two-fifths of the length of the second and third combined. The arista is short, basally thickened and light brown. *Thorax*: mesonotum and scutellum shining black with appressed, pale-coloured, wiry pile which proceeds from black tubercles. The

scutellum is evenly rounded without spines or emarginations. The pile is similar to that of the thorax. *Abdomen* : about twice as long as broad and broadest on the basal half ; it is tuberculate with setate pile which is especially large upon the second segment. The second segment is short and is four or five times as broad as its length in the middle ; the third segment is one-and-one-half times wider than long ; the fourth and fifth segments are fused and almost as long as the basal part of the abdomen. The third and remaining segments are turned down at the sides : the first segment and the second segment are blackish upon the sides. The posterior margin of the second segment almost to the corners, the whole of the third segment and the base of the fourth are narrowly and diffusely light red. The remainders of the fourth and fifth segments are black. The hypopygium is not especially large and is dark brown in colour ; the silvery pile of the abdomen is arranged as a diagonal band across the corners of the third segment, which reaches to the apex of the segment but does not fill out the anterior corners : there is a similar, more extensive, silver stripe of pile which is more or less triangular and begins broadly on either side of the basal margin of the fourth segment and proceeds, narrowing, diagonally to the corners of the tip of the abdomen. There is a broad patch of such sparse pale pile beginning in the middle of the fourth segment and extending broadly upon the apical margin at the end of the abdomen. *Legs* : dark in colour, the femora and posterior tibiæ black. The anterior tibiæ are dark brown, their tarsi somewhat lighter. The two basal hind tarsal joints are blackish, black pilose and silvery pubescent, and yellow pilose ventrally. The hind basitarsi are considerably enlarged. The following segment is also somewhat broadened and enlarged and barely longer than wide. Subterminal segments of all of the tarsi wider than long. The hind femora are not greatly thickened ; all of the tibiæ are conspicuous for their thick, silvery, scalose pile. The halteres are pale, the squamæ similar. *Wings* : very dark and evenly tinged with brown, with a well-developed stigmal cross-vein present ; the subapical cross-vein is recurrent. The outer bulge of the posterior corner of the cell is somewhat rounded and without spur.

*Holotype* : a male, and a *paratype* male from the Port St. John, Pondo Land, Feb. 6-25, 1924, South Africa (*R. E. Turner*), British Museum, 1924 : 136.

*Microdon albofascia*, sp. n.

Somewhat similar to *carbonarius* Brunetti, although the scutellum is without spines. Blackish flies, the post-margin of the third and fourth and all of the second segment brassy-whitish pilose.

*Female*.—Length 13.5 mm. including antennæ; first antennal joint 1 mm., others missing; wings 10 mm.

*Head*: the dorsal, posterior occiput is tumid but rounded; together with the front and vertex and face, it is dark, shining, brownish black in ground-colour and somewhat roughened, with yellowish-brown pile which becomes golden upon the front; the front is bare just above the antennæ and has at most only faint striations. The front is without transverse groove and the ocelli are set very flatly upon the front. The face is rather convex, becoming more so ventrally as the face retreats to the epistoma. The pile of face is thick, shining, pale yellowish and directed downward. The first segment of the antennæ is black and quite elongate; others missing. Eyes bare. *Thorax*: dully shining brownish black, covered densely with shining reddish pile on the entire anterior half which is visible only from the front; but there is a thin line of such pile visible along the suture and above. The posterior sides of the mesonotum, the posterior calli and posterior margins and sides of scutellum are covered with similar, shining reddish pile. The middle of the posterior half of the mesonotum is broadly black microsetose pilose; there is some black pile present also upon the disc of the scutellum, which, like the mesonotum, is prominently rugose from the tuberculate pile. The scutellum is evenly rounded, without spines and not emarginate. *Abdomen*: somewhat more than half again as long as wide and broadest at the end of the moderately long and much flattened second segment; the first segment is short; the abdomen is thrust downward at the beginning of the third segment; its sides are moderately curved over posteriorly and the tip of the abdomen is obtusely pointed, not rounded. The abdomen is dark, brownish black in colour, the posterior half of the first segment, the whole of the second, the narrow basal corners of the third, a broad, posterior margin upon the third segment that, however, does not reach the sides but is continuous with similar material on the anterior corners of the fourth segment, are all pale, shining, appressed, yellowish scalose pilose. There is a prominent, wide band on the

posterior third of the fourth segment which is not at all interrupted in the middle and almost reaches to the posterior corners. The remainder of the pile upon the base of the third, fourth and whole of fifth segments may in the proper lights from the side be seen to be chiefly reddish pilose. There are apparently a few black hairs intermixed. *Legs*: blackish upon the first and second femora except upon their apices and except upon the basal third to one-half of the hind femora; the remainder of the legs is light reddish and covered chiefly with silvery pile. *Wings*: strongly tinged with brown, a strong stigmal cross-vein present; the subapical cross-vein is perfectly straight, slightly recurrent and without an apical spur at its base. Vena spuria merely a faint fold.

*Holotype*: a female. North Burma, Adung Valley, 12,000 ft., July 10, 1931 (*Lord Cranbrook*) British Museum. 1932: 196..

*Microdon bicolorata*, sp. n.

Related to *flavipennis* Sack, the apical half of the wing is black, the base yellow.

*Male*.—Length 15 mm. exclusive of antennæ; first two antennal joints 2.3 mm.; third missing, presumably elongate since the first two are quite slender; wing 10 mm.

*Head*: the eyes are moderately separated; the vertex, front and face are shining black in ground-colour, the latter with perhaps a faint bluish-purple cast; the front and vertex are very rough, black pilose; there are a few pale hairs lying within the transverse depression which separates the nearest approach of the eyes to each other. Just above the antennæ there are three longitudinal conspicuous grooves, which are half of the length of the distance from antennæ to the transverse depression. This area above antennæ is bare. The ocelli are set upon a small hillock. The eyes are bare, the face in profile has the merest suggestion of a concavity; it is very slightly retreating down to a point about one-third from the epistoma and then more rapidly retreating. The pile of the face is shining whitish and directed downward, with a very few black hairs and with a thick row of shining, white pile along the upper parts of the eye-margins. The face is roughened by prominent micro-tubercles from which the pile arises. The first two joints of the antennæ are black, the third missing. These segments are quite slender, consequently the antennæ is most certainly of the elongate type. *Thorax* and scutellum wholly shining black and very roughly tuberculate with black, appressed, setate pile, there are one or two



reddish hairs, and a few pale hairs narrowly along the outer portions of the suture and upon the anterior inner ends of the humeri. *Abdomen* : quite elongate, the second segment the widest, the remainder of the abdomen barely less wide, and from the ends of the short second segment, the elongated portion of the abdomen has practically parallel sides and is quite thick and strongly subcylindrical. Abdomen wholly dully shining blackish, perhaps brownish black upon the terminal portion ; it is very much tuberculate, with abundant, black, shining, microsetate pile, which on the extreme sides of the third segment forms a diagonal band which begins in the anterior corners of that segment ; there is also a similar, somewhat more extensive triangle on the anterior corners of the fourth segment, reddish or yellowish to whitish in appearance. The pale pile cannot be discerned from the upper half of the abdomen except very narrowly in the anterior corners of the fourth segment. There is considerable reddish pile upon the second segment and this segment is elevated medially into a blunt, medial ridge, leaving a depression on either side along the anterior and posterior borders of that segment. The first segment is almost hidden by the scutellum ; the scutellum is without spines or emargination. Squamæ dark brown ; halteres orange. *Legs* : the femora are wholly black, the hind pair slender, short and rather weak for the size of the species ; the tibiæ are all very dark brown, almost black, the tarsi similarly coloured ; the hind basitarsi are but little thickened. *Wings* : with the basal half bright, brownish yellow ending at the strong stigmal cross-vein and the middle cross-vein and extending on down to the confluence of the fifth and sixth longitudinal vein at the end of the anal cell. The remainder of the wing outwardly is uniformly a rich sepia-brown. The subapical cross-vein is nearly straight, barely bent inward and joins the third longitudinal vein at right angles ; only its basal half has any resemblance of recurrence. There is a trace of spur on one side and a short spur upon the other.

*Holotype* : a male. Dutch East Indies, Sumbawa, or Sepanjang Island, purchased E. Le Moult, British Museum, 1933 : 189.

This species may possibly prove to be *wulpii* Muls. or *apicalis* Walker \*. In the arrangement of wing pattern it is

\* Professor Hull's *bicolorata* is not *apicalis* Walker. The type-specimen of *apicalis* has a brassy pile on the vertex, front and face ; the wing is much infuscated, with no delimitation of an outer dark part and inner clear or yellow part ; the thoracic pile is brassy.—  
JOHN SMANT.

the opposite of *pretiosa* Curran, in which the base of the wings is brown and the apical half is yellowish.

*Microdon sulcata*, sp. n.

Characterized by the dark mahogany, deep punctate abdomen, the last two segments thick, flat, pale golden pilose; the deeply emarginate scutellum is similar to *trimaculata* Curran, but *sulcata* is readily distinguished by the black pile upon the base of the abdomen and by the black legs.

*Female*.—Length 9 mm. excluding antennæ; first antennal joint nearly 1 mm. long; wings 7 mm.

*Head*: the vertex protuberant, the eyes moderately separated, with a broad, shallow depression separating them at their nearest point, but no groove; this depression in the middle is confluent with a medial, shallow depression running upward and dividing on either side of the ocelli. The front and vertex are dark, brownish black, feebly shining, their pile chiefly pale yellow and shining. Eyes bare. The face is light yellowish brown or clay-coloured, with thick, appressed, shining, downward-directed, pale yellow scabrous pile. The first antennal segment is slender, light brown with black pile; second segment about one-third as long as first, third segment missing. *Thorax*: short and broad, feebly shining blackish with an obscure, medial vittæ of pale yellow pile; there is a narrow, transverse complete vittæ of the same across the mesonotum and a small patch of the same on the posterior corners of the mesonotum and upon the posterior calli. Actually the medial and transverse vittæ of the mesonotum are interrupted in the middle, but are probably continuous in better-preserved specimens. Scutellum large, rather long and rather deeply sulcate in the middle; the prominent, blunt spurs are moderately widely separated. The scutellum is dark, shining, chestnut-brown, and pale yellow pilose, the pile proceeding from large, flat tubercles. The mesonotum of the thorax is densely micro-tuberculate. *Abdomen*: broad, much wider than thorax, very dark shining chestnut-brown, and lighter brown upon the fourth segment; the appressed, black setæ of at least the second and third segments appears to arise from gross black punctures rather than tubercles. The whole pile upon the fourth and fifth segments is flat-appressed, dense, posteriorly directed, pale yellowish, shining, and covers the whole of these segments. That upon the anterior corners of the third segment is first directed upwards

and then posteriorwards. The abdomen is strongly turned downward from the base of the third segment. *Legs* : blackish, everywhere black pilose. The hind basitarsi are considerably thickened, all of the subbasal and subapical tarsal segments wider than long. *Wings* : rather pointed, the basal half of the subapical cross-vein proceeding rectangularly from the fourth longitudinal vein, straight for half of its distance, then turned outward for a short distance and back to the third vein to join it rectangularly. The vena spuria is a mere fold ; the entire wing is pale brownish and darker along the anterior border. Stigmal cross-vein present.

*Holotype* : a female and one *paratype* female. Java, Soekaboemi, April, 1926, purchased E. Le Moul't, British Museum, 1933 : 189.

*Microdon flavipennis* Sack, var. *nigrita*, var. nov.

*Male*.—Length 20 mm. without antennæ ; antennæ about 4.5 mm. ; wing 15 mm.

*Head* : eyes bare, moderately separated, the ground-colour of the front and face is very dark, shining, chestnut-brown, upon the front more nearly black ; the pile of the front and vertex is black, of the face yellow and black intermixed. The face is very shallowly concave beneath the antennæ, then retreats to the epistoma. The antennæ are elongate ; first segment almost as long as second and third together ; second segment about two-fifths of the length of the third segment. Antennæ wholly black and black pilose. *Thorax* and scutellum dully shining black with appressed, wholly black, tuberculate, setaceous pile. *Abdomen* : elongate, broadest basally, wholly shining black, with similar, tuberculate, appressed, setate pile everywhere black in colour. *Legs* : black, the anterior tibiæ and apical portions of the first and second femora very dark brown or blackish brown. The anterior tarsi are dark brown, the posterior tarsi black, the basitarsi rather long, somewhat thickened and, together with the ventral apical third of the hind tibiæ, covered with golden-red pile. Only the outer dorsal surface of the hind basitarsi has black pile. *Wings* : wholly light brownish yellow, there is a strong stigmal cross-vein present ; the subapical cross-vein is practically straight and joins the third longitudinal vein at right angles, with only a very faint trace of spur in the corners.

*Holotype* : a male. Philippine Islands, Mindanao, May 14, 1920 (*Dr. A. Moore*), British Museum, 1921: 449, "tree stump."

This specimen is very close, if not identical, with *M. flavipennis* Sack, described from the Philippine Islands. There is no trace of the red hairs on the scutellum or abdomen in this specimen and there are other minor differences; consequently I name it as a variety of Sack's species.

*Microdon aurilinea*, sp. n.

Related to *auriscutatus* Curran, but distinguished by the convex profile of the face, the median gold vitta of the thorax restricted to the posterior half, the whitish pile of the last abdominal segment, etc.

*Male*.—Length 10.5 mm. excluding antennæ; wing 8 mm.

*Head* : the vertex is dark shining chestnut, the ocelli not conspicuously raised; the occiput along the eye-margins has flat, shining, golden pile directed towards the eyes; the vertex on either side of the ocelli has similar pile directed toward the ocelli and anteriorly developed diagonally towards the mid-line, but farther down the eye it is directed ventrally; all the pile is quite flat in appearance. The front is flat, bare, and shining black upon a large triangular area before the antennæ. The antennæ are missing. The face is black, obscured by very thick, flat, scaly, pale golden pile; there is no bare line upon the middle of the face. The eyes are a little mouldy, but appear to be bare. *Thorax* : black, obscurely shining, the greater part of its pile extremely short, flat, microsetate and black. There is a prominent, transverse, complete fascia of gold pile across the suture and a similar one along the anterior margin which on the lateral margins is connected with a broad patch upon the propleura, mesopleura, upper sternopleura and anterior pteropleura and, through the lateral margin, is connected with a prescutellar fascia of similarly-coloured pile. The prescutellar fascia and the sutural fascia are connected by a narrow scalose line in the mid-line. The scutellum is wholly covered by flat golden pile without spines. *Abdomen* : broad and compact, a little wider than thorax; the first two segments are flattened with flat, shining, yellow pile extending upon the posterior half of the first segment. The whole middle of the third segment is covered with similar pile as well as its broad sides, leaving only a diagonal stripe of black pile, which is rather wide, on each

side. The fourth segment has a large triangle of such flat pale pile narrowly covering the entire anterior margin and extending the full length of the sides, and with on either side of the dorsum of the fourth segment a broad, posteriorly-directed band of pale pile which is widely separated in the middle, is confluent at the posterior margin, is rounded upon its anterior end where it begins, and separated from the stripe of the opposite side as well as from the anterior lateral and basal band by a broad stripe of black, flattened pile, on either side. *Legs* : anterior femora on the basal half, the basal third of the middle femora and whole of hind femora are dark brown ; elsewhere light reddish brown. The anterior tibiæ, except for a wide subapical band, the middle tibiæ similarly and hinder tibiæ also similarly light reddish brown, but dark brown apically or subapically. The tarsi are reddish brown, the posterior basitarsi somewhat thickened. The pile of the legs is wholly pale. *Wings* : strongly tinged with brown ; a strong stigmal cross-vein is present ; the subapical cross-vein is quite straight and strongly recurrent ; there is a short spur from the posterior corner of the first posterior cell.

*Holotype* : a male, and a *paratype* male. *Allotype* : a female, and two *paratype* females. Java, Soekaboemi, from March to June, 1926, purchased E. Le Moul't, British Museum, 1933 : 189.

This species appears to be very near *auriscutatus* Curran, from the Malay States ; however, the profile of the face is quite convex, the median gold vittæ of the thorax runs only upon the posterior half, the pile of the abdomen on the fourth and fifth segment is more whitish and not gold, the subapical tarsal joints are not infuscated, and there is a spur to the subapical cross-vein at its base in these specimens, not described in *auriscutatus*. *Auriscutatus* was described both from the Malay States and from Siam. The male appears to be essentially similar to the female.

*Microdon fumipennis*, sp. n.

Related to the species with unspined scutellum, such as *simplicicornis* de Meijere, but distinguished by the golden-green thorax ; abdomen green and violet-coloured ; wings smoky.

*Male*.—Length 11.3 mm. without the antennæ ; antennæ 2.4 mm. ; wings 8 mm.

*Head* : the vertex is dark shining, greenish violet on either side of the eye with wholly pale pile, the ocelli not conspicuously raised. The eyes are set fairly close and connected by a flat depression with a groove at the bottom. The lower part of the front and face is black with a bronze and greenish lustre, the pile shining and white, the mid-line obscurely bare only upon the upper half. The eyes are bare and waxy. The antennæ are only moderately elongate, the third segment four-fifths as long as the first segment ; the second segment one-third as long as the third ; the arista is dark. *Thorax* : strongly metallic golden brown, but greenish before the scutellum and upon the sides, and covered with dense, sub-erect brownish-yellow shining pile. The scutellum is evenly rounded with perhaps a tiny impression in the middle upon the margin, and it is without spines ; it is shining green in colour, with erect golden pile. *Abdomen* : broad, wider than the thorax, compact, thickened and convex upon the fourth segment ; the first and second segments are punctate, or perhaps tuberculate, and shining green in colour ; the third segment is blackish, but green on the posterior two-thirds ; the fourth segment is green in the lateral corners, on the lateral margins and broadly upon the posterior two-thirds of the middle. The pile is arranged in conspicuous whitish fascia along the posterior margin of the second segment ; these fascia begin a little on either side of the mid-line, and are similarly placed upon the posterior margin of the third segment ; again, on the third segment, they lie on either side of the mid-line and continue from the posterior corners of the third segment on until they are confluent with similar pile in the anterior corners of the fourth segment ; the pile on the fourth segment begins near the mid-line, but is separated and forms a diagonal fascia about one-third of the distance from the base of similar whitish pile and proceeds to the posterior corners of the fourth segment. All three of these fascia, the first two transverse, and the third one diagonal, are connected by shining white pile along the margins of the abdomen. *Legs* : femora dark blackish brown, the hinder pair darker ; all of them with a greenish cast which is pronounced on the last pair. The tibiæ are light brown with bushy silvery pile, particularly on the ventral sides ; there is a dark spot just past the middle ; the bases of the tibiæ are narrowly yellowish, the hind tibiæ greenish about the cicatrix in the middle. The tarsi are reddish brown, the pile of the legs is everywhere pale. The

squamæ are whitish with pale yellow fringe ; halteres reddish brown. *Wings* : strongly tinged with brown, a strong stigmal cross-vein present, the posterior corners of the first and second posterior cells broadly rounded and without spur ; the sub-apical cross-vein is bent slightly inward, its last section rectangular to the third longitudinal vein.

*Holotype* : a male. Java, Sockaboemi, purchased E. Le Moult, British Museum, 1933 : 189.

XXIX.—*An Annotated Bibliography-Chronology of the Literature and Events relating to the Generic Names of Meigen, 1800.* By JOHN SMART, Ph.D., Department of Entomology, British Museum (Natural History).

THE problem of Meigen's names of 1800 has been before nomenclatorists in general, and dipterists in particular, since Hendel (1908) revived their use. Thrice has the matter come to the fore, in 1908, 1932 and 1941 (see Hendel (1908), Edwards (1932) and Stone (1941)). The question of whether to use these names or not remains unsettled, and dipterists themselves tend to be either violently "pro" or "contra" their use. Apart from the papers that actually affect the nomenclatorial points at issue, there is now quite a literature on the subject.

Stone (1941), discussing the application of the names, gave a list of "references" which, however, did not by any means constitute a complete guide to the relevant literature. This is unfortunate, because a comparatively small extension of Stone's list would have provided a bibliography on the subject and rendered the present paper superfluous.

The present bibliography may also be incomplete, but it contains every relevant reference that can be culled from a perusal of all the papers listed and from such other sources as are at the writer's disposal.

References with the author's name in Clarendon (bold face) are those papers which should, or rather must, be consulted in the original if an independent conclusion is to be reached as to the status of the 1800-names, without reference to the personal opinions of dipterists. Some help will, however, be obtained by reading the more opinionated papers which contain perfectly relevant

practical points as well as a certain amount of lively invective.

The annotations have been made as impartially as possible, but lest any bias be detected the writer hastens to admit that he is personally thoroughly prejudiced against the use of the 1800-names.

1764 (3 May). MEIGEN, Johann Wilhelm, born at Solingen.

1800. MEIGEN, J. [Guillaume], *Nouv. class.*, 40 pp. Fuchs (Paris).

In this work the disputed generic names were published. The number of species included in the genera is mentioned by the author but not the names thereof. The following footnote is attached to the number of species indicated for the first genus: "Le nombre des espèces, indique celles que j'ai vues moi-même en nature, et qui sont toutes européennes." The footnote is obviously intended to apply throughout the whole paper; it was omitted by Hendel (1908) (see below) when he reprinted (in part) Meigen's paper; it is quoted here since it is of interest in connection with the selection of genotypes. Meigen deals with 25 genera of older authors and 63 new genera of his own; they are numbered serially 1-88. There is an Introduction by Baumhauer, who may be regarded as the editor of the work and an *avant-propos* by Meigen. It is in the French language.

1802. LATREILLE, P. A. *Hist. Nat. gen. part. Crust. Ins.*, 418-467. Dufart (Paris).

On page 418, a footnote to the sub-title "Dipteres; diptera (1)," Latreille makes it perfectly clear that he is acquainted with Meigen, with Meigen's work on Diptera, and with Meigen's paper of 1800. Latreille did not use any of the Meigen 1800-names for the genera in his book. He did, however, indicate which of Meigen's 1800-names were equivalent to certain of his own genera or subdivisions thereof. He also mentioned typical species ("Exemples," for the definition of which see LATREILLE (1804) *Nouv. Dict. N. H.*, 24 : 189). It is therefore possible to say that he associated (? included) species with certain of the Meigen 1800-genera. Thus, in treating the "Genre Bibio; bibio," Latreille gives a diagnosis of the genus



and then "Exemples. *Tipula hortulana* Lin.—*Hirtea hortulana* F.—Les genres *hirtea*, *philia* de Meigen." Only 17 of the names of the 1800 paper are mentioned.

1803. **MEIGEN**, J. W. ("Die Versuch"), *Illiger's Magazin für Insektenkunde*, 2 : 259–281.

This work is obviously in the nature of a prodrome to Meigen (1804), which is dealt with immediately below. It may be said to be the foundation upon which the nomenclature of the Diptera rested till Hendel (1908) revived the names of 1800.

114 generic names are dealt with ; some of them are those of older authors ; others are newly proposed names ; there are three names that appeared in the 1800 work (*Chrysops*, *Chrysogaster* and *Lap(h)ria* \*), but since the work of 1800 is nowhere mentioned, they would be considered as new names of 1803 by any one ignorant of the contents of the 1800 work. Some of the genera of the 1803 work have the names of one or more species associated (? included) with them ; others have no species, named or otherwise, attached to them, but at a later date Meigen himself, in other works, did associate named species with these. It is important to note that the serial arrangement of the genera of older authors mentioned in both the 1800 and the 1803 papers is not the same. The paper is in the German language.

1804. **MEIGEN**, J. W. *Klass. Besch. eur. zweifl. Ins.*, Vol. 1, Pt. 1 : i–xxviii + 1–152 ; Pt. 2 : i–vi + 153–314.  
Reichard (Braunschweig).

This volume is obviously intended to be the first instalment of an elaborate work on the Diptera. Only part of the Diptera are dealt with in detail, but there is an outline classification in which the whole order is divided into genera ; no other volumes ever appeared. There is no difficulty in dealing with the status of any of the names, generic or otherwise, in this volume. Generic names from the paper of 1803 are used. There is no mention of the paper of 1800 and none of the new names proposed therein are used. In the introduction to the volume Meigen summarizes the classifications of Lin-

\* Throughout the remainder of this article these three exceptions are to be understood as made whenever the 1800-names are mentioned as a group.

(*Lapria* (1800), *Laphria* (1803).)

neæus, Degeer, Fabricius and Latreille (1802), but he omits any reference to the use of the 1800-names by the last author \*.

1805. LATREILLE, P. A. *Hist. Nat. gen. part. Crust. Ins.*, 14 : 259-396. Dufart (Paris).

In this and subsequent works Latreille uses the system that gradually developed out of Meigen's paper of 1803 and Meigen's book of 1804 (see above); at no place does he allude to Meigen's 1800 paper nor to any of the 1800-names which he had mentioned in his book of 1802.

- 1818-38. MEIGEN, J. W. *Syst. Besch.*, Vols. 1-7. (Aachen & Hamm).

This is Meigen's major work on the Diptera. Such was its reputation that there was a sequel of three further volumes by Loew. Nowhere is the work of 1800 mentioned, nor are any of the 1800-names used.

- 1833 (6 Feb.). LATREILLE dies at Paris.

1837. PERCHERON. *Bibliogr. Entom.*, 1 : 18. (Paris & London).

The 1800 work is quoted under Baumhauer, who wrote the introduction and edited it. Percheron says "C'est un extrait de l'ouvrage de Meigen."

- 1845 (11 July). MEIGEN dies at Stolberg im Rheinland.

1852. AGASSIZ, L. *Bibliogr. Zool.*, 3 : 576. Ray Soc. (London).

The work of 1800 is quoted under Meigen's name without reference to Baumhauer. It may be noted that the 1800-names are not listed in Agassiz's *Index Universalis* (1846 and 1848).

1862. HAGEN, H. A. *Bibliogr. Entom.*, 1 : 529.

The 1800 work is quoted under Meigen's name.

1882. OSTEN-SACKEN, C. R. *Wein, ent. Zeit.*, 1 : 191-193.

\* Coquillett (1908) (see below) says "in giving a resumé of Latreille's classification Meigen himself connected most of them (the 1800-names) with his 1803 names in giving a resumé of Latreille's classification (see his 'Klassifikation und Beschreibung der europäischen zweiflügeligen Insekten,' 1804, pages xv.-xxvii.)." This connection is very indirect if it can be said to be a connection at all; in any case no 1800 names are mentioned and the only thing that is proven is that Meigen was acquainted with Latreille's publication of 1802.

In this paper, in which the author discusses the question of "Priorität oder Continuität" (he favours the latter), the Meigen 1800 paper is mentioned and some indication is given of its contents. Some of the names are quoted but the Baron states that in his opinion the genera cannot be identified. Latreille's mention of the names in his book of 1802 is also alluded to. Osten-Sacken had a copy of the 1800 paper.

1883. FRIEDLANDER & SOHN'S *Catalogue*, 342 : 24.

Meigen (1800) *Nouv. class.* offered for sale at 6 marks.

1891. BRIT. MUS. *Cat. Printed Books*. Part MB-MEINHOLD, col. 202.

Lists a copy from the Banks collection.

1902. ZOOL. SOC. *Cat. Libr. Zool. Soc. Lond.*, 5th ed. 410.

The paper of 1800 is catalogued.

1903-5. BECKER, T., BEZZI, M., BISCHOF, J., KERTÉSZ, K., and STEIN, P. *Katalog der Paläarktischen Dipteren*, vols. 1-4. (Budapest).

In this catalogue there is no mention of the generic names of Meigen (1800); its various parts were prepared by one or other of the joint authors, who were all distinguished Dipterists. The catalogue is frequently spoken of as 'Kertész's Catalogue,' but it must be clearly distinguished from the world catalogue of Kertész (1902-10) (see below) a work which, since it was never completed, is not so well known as the Palearctic catalogue.

1906 (20 June). OSTEN-SACKEN dies at Heidelberg.

1905. ALDRICH, J. M. *Catalogue North American Diptera. Smiths. Misc. Coll.*, No. 1444, 680 pp. (part of vol. 46). (Washington).

Meigen (1800) not mentioned in the bibliography; none of the 1800-names mentioned.

1908. HENDEL, F. *Verhandl. zool.-bot. Gesel. Wien*, 58 : 43-69.

In this paper Hendel reprinted, in part, Meigen's paper of 1800. The title-page, the introduction by Baumhauer, the *avant-propos* by Meigen and the footnote already

quoted (see Meigen (1800) above) were all omitted. The numbered sections (1-88), each with its generic name, the diagnosis thereof and the number of included, but unnamed, species were given by Hendel in full (but not in facsimile), with interpolations, and the use of different type-faces to show the synonymy as decided by Hendel. Hendel stated in the paper how he had recognized the 1800-genera, namely, by comparing the 1800 diagnoses (in French) with the diagnoses of the 1803 paper (in German) till he had succeeded in pairing them off. He states explicitly that till he hit on this method of identifying the 1800-genera he was quite unable to recognize them from their diagnoses alone. It is important to remember the state of development of the International Rules of Nomenclature at the date at which Hendel was writing; Hendel believed he was doing perfectly straightforward scientific work in synonymizing the genera without paying any attention to the question of genotypes.

At the date at which Hendel wrote it was believed amongst Dipterists that but two copies of Meigen's 1800 paper existed—Osten-Sacken's and Hendel's. Several others have since come to light but many authors depended, at first at any rate, on Hendel's reprint in place of the original paper. The use of photostats of the original paper has now overcome this trouble.

1902-10. KERTESZ, K. (*Catalogus Dipteriorum*. Vol. 1 (1902), Vol. 2 (1902), Vol. 3 (1908), Vol. 4 (1909), Vol. 5 (1909), Vol. 6 (1909), Vol. 7 (1910).

This world catalogue is not to be confused with the Palearctic catalogue (Becker, *et al.* (1903-5) see above), which is frequently spoken of as 'Kertész's Catalogue'; it was never completed, vol. 7 carries it to and includes the *Cyclorrhapha-Aschiza*.

There is nothing of Meigen (1800) or of the 1800-names in vols. 1 and 2. In vol. 3 (and later vols.) the relevant 1800-names are introduced and the equivalent names of 1803 sunk as synonyms. Vol. 3 deals with specific names published up to 1905.

1908. BEZZI, M. *Wien. ent. Zeit.*, 27 : 252.

Here Bezzi reviews Vol. 3 of Kertész's *Catalogus Dipteriorum* (1908) and comments on the use of the

1800-names therein. This review is quoted in Aldrich (1908 *b*).

1908 *a*. ALDRICH, J. M. *Canadian Entomologist*, 40 : 370-373.

The first comment on Hendel's action in reprinting the 1800 paper and endeavouring to introduce the generic names of 1800. Aldrich is against the use of the names and remained so till his death.

1908 *b*. ALDRICH, J. M. *Canadian Entomologist*, 40 : 432.

1908. COQUILLETT, D. W. *Canadian Entomologist*, 40 : 457-458.

Coquillett approved of the use of the 1800-names and used them till his death.

1908. WILLISTON, S. W. *Manual of North American Diptera*, 3rd ed., page 390 (a note, without title, in the appendix). Hathaway (Newhaven).

Williston disapproves of Hendel's attempt to introduce the 1800-names.

1909. VERRAL, G. H. *British Flies*, 5 : 772. Gurney & Jackson (London).

In a note, Verral shows himself opposed to the use of the 1800-names; he deprecates Hendel's action in attempting to introduce them.

1909. HENDEL, F. *Wein. Ent. Zeit.*, 28 : 33-36.

Here Hendel replies to Aldrich's criticism. His tone is spirited and the paper cannot be described as an impersonal statement of cold facts. From about this date dipterists began to be divisible into "pro-Meigen-1800" and "anti-Meigen-1800" groups and the presentation of the dispute becomes diffuse, much irrelevant matter is introduced and personal animus becomes obvious. American entomologists, with Aldrich's lead, ignored Coquillett's use of the names in 1910 (see below) and refused to use the 1800-names. British entomologists, almost without exception, followed Aldrich's lead. Continental workers tended to be divided.

1909. ALDRICH took steps about this time to bring the question of the 1800-names before the International Commission on Zoological Nomenclature. He hoped

to get a declaration that the names could not be, or were not to be, used (see Aldrich (1911 a)). In this he failed (see Op. 28 (1910)).

1910 (Oct.). **INTERNATIONAL COMMISSION ON ZOOLOGICAL NOMENCLATURE**, Opinion 28, in *Smithsonian Publication* no. 1989 : 66-67.

In effect this Opinion decided that Meigen's paper of 1800 was a genuinely published work and, therefore, the names therein were available if found valid under the International Code. The Opinion should be read, in full, in the original publication.

1910 (4 Aug.). **COQUILLETT**, D. W. Type-species of the North American Genera of Diptera. *Proc. U.S. Nat. Mus.* (no. 1719) 37 : 499-647.

The 1800-names are used as valid names and the well-known names of 1803 sunk as synonyms where this course is indicated by the rules as interpreted by the author. Genotypes are designated: in most cases the author selects as genotype the same species as was the recognized genotype of the equivalent 1803 Meigen genus, thus ensuring that the two would be synonymous. In spite of the use of the 1800-names in this very valuable work they were not accepted into North American dipterological literature.

1911 a. ALDRICH, J. M. *Canadian Entomologist*, 43 : 34-35.

Notes on the history of the application to the Commission which resulted in the publication of Op. 28.

1911. COQUILLETT, D. W. *Canadian Entomologist*, 43 : 66.

1911 b. ALDRICH, J. M. *Canadian Entomologist*, 43 : 108.

1911 (7 July). COQUILLETT dies.

1912. ALDRICH, J. M. *Canadian Entomologist*, 44 : 104.

1912 (Feb.). **INTERNATIONAL COMMISSION ON ZOOLOGICAL NOMENCLATURE**, Opinion 46, in *Smithsonian Institution Publication* 2060 : 104-107.

On the "status of genera for which no species was distinctly named in the original publication." Of great importance in connection with the selection of genotypes

for the 1800-genera (quoted in detail by Collin (1942) (see below)).

1914 (March). **INTERNATIONAL COMMISSION ON ZOOLOGICAL NOMENCLATURE**, Opinion 65, in *Smithsonian Institution Publication* 2256 : 152-169.

"On the case of a genus based upon erroneously determined species." Of importance in connection with the application of a few of the generic names of 1800.

1914. **INTERNATIONAL COMMISSION ON ZOOLOGICAL NOMENCLATURE**—war interrupts work.

1925. **LINDNER**, E. *Flieg. pal. Reg.*, 1 : 10-13.

Lindner published a section in this introductory volume entitled "Meigen und der Beginn des 19. Jahrhunderts." He comments on the 1800 paper, gives a list of generic synonyms and proceeds to use the 1800-names (and family names derived therefrom) in his book.

1932 a. **EDWARDS**, F. W. *Entomologist*, 65 : 13-14.

Edwards here publishes a "Questionnaire" addressed to dipterists and others interested, on the subject of the 1800-names. The same article was published in the *Ent. mon. Mag.* (1932 b) and the author distributed it widely in reprint form.

1932 b. **EDWARDS**, F. W. *Ent. mon. Mag.*, 68 : 1-3.

The same article as immediately above.

1932. **HENDEL**, F. *Ent. mon. Mag.*, 68 : 59-62.

A rejoinder to Edwards's article. The most interesting point in it is that Hendel points out that Latreille used some of the 1800-names in 1802 and points to the fact, that Latreille's application of the names was, in the main, similar to Hendel's application of them in 1908, as proof that his application of them is satisfactory. This is a revealing statement : it shows that Hendel had had the temerity to attempt to revive the 1800-names by deciding what was the equivalent name in Meigen's work of 1803 *without* consulting Latreille's work of 1802. That a dipterist of Hendel's reputation should have ignored Latreille (1802) when dealing with names published in 1800 and 1803 is indeed remarkable.

1932 c. **EDWARDS**, F. W. *Ent. mon. Mag.*, 68 : 62-64.

A rejoinder to Hendel (1932).

- 1932 *d.* EDWARDS, F. W. *Ent. mon. Mag.*, 68 : 255-258.

Edwards publishes the results of his "Questionnaire." The names of those replying are given in a footnote.

1932. GOFFE, E. R. *Ent. mon. Mag.*, 68 : 272-276.

Goffe's comments on the dispute ; he is pro-1800-names.

1932. INTERNATIONAL ENTOMOLOGICAL CONGRESS meets in Paris. An *ad hoc* Committee was set up to consider the problem of the 1800-names and the Congress eventually passed a resolution (see immediately below) that was, however, *ultra vires*.

1933. BERLAND, L., & JEANNEL, R. *V<sup>e</sup> Congrès International d'Entomologie*, 1 (*Compte Rendu*) : 58.  
(Paris).

In 'Rapport du Secrétaire du Comité Exécutif' (pp. 56-58). Item 6. Meigen, Nouvelle Classification, 1800. Resolution : La section VIII, étant d'opinion qu'il y aurait maintenant plus de confusion à rejeter les noms générique de la "N. C." de Meigen 1800 qu'à les retiner, recommande conséquent qu'ils soient définitivement adoptés.—*Adopté par majorité contre dix voix*.

1933. CURTIS, W. P. *Ent. mon. Mag.*, 69 : 38-41.  
1933. EDWARDS, F. W. *Ent. mon. Mag.*, 69 : 59-61.  
1933. COLLIN, J. E. *Ent. mon. Mag.*, 69 : 61-65.  
1933. ALDRICH, J. M. *Ent. mon. Mag.*, 69 : 86-89.  
1933. GOFFE, E. R. *Ent. mon. Mag.*, 69 : 134-139.  
1933. ALDRICH, J. M. *Ent. mon. Mag.*, 69 : 255.

The above six papers are all consequent on Edwards's publication of his "Questionnaire" and the action of the International Entomological Congress. Much of their content is quite irrelevant to the purely nomenclatural problems at issue.

1934 (27 May). ALDRICH dies.

1936 (26 June). HENDEL dies.

1934. CURRAN, C. H. *North American Diptera*. 512 pp.  
Curran (New York).

The 1800-names are not used.

1935. INTERNATIONAL COMMISSION ON ZOOLOGICAL NOMENCLATURE meets at Lisbon. The question of



the 1800-names of Meigen as it arose out of the *ultra vires* resolution of the V<sup>e</sup> International Entomological Congress at Paris was considered (see International Commission on Zoological Nomenclature 1943, below.)

1936. ENDERLEIN, G. *Tierwelt Mittel Europ.*, 6, iii, 2, *Diptera*.

Enderlein does not use the 1800-names.

1937. SEGUY, E. *La Faune de la France*, 8 *Diptera*, 216 pp. Delagrave (Paris).

Here Seguy uses some of the old-established names of Meigen 1803, etc., and some of the 1800-names, e. g. *Mycetophila* (1803) and *Chrysozona* (1800). He has, in fact, temporized and abstained from using 1800-names where they affect the names applied to families! N.B. This is not the *Faune de France* series of Chevalier (Paris); in the latter series Seguy uses 1800-names in vols. 36 (1940) and 28 (1934), even where they affect family names, but in vols. 17 (1927), 13 (1926), 12 (1925) and 6 (1923) he uses the old-established names of 1803, etc.

1940 (15 Nov.). EDWARDS dies.

1941. STONE, A. *Ann. Ent. Soc. Am.*, 34 : 404-418.

Stone endeavours to show the exact application of the 1800-names when these are interpreted strictly according to the Code. He publishes a table showing how he, Lindner (1925) and Curran (1934) apply different names to the same genus in a number of cases. This table is invaluable as a demonstration of the chaos that the introduction of these 1800-names has produced. Stone advocates the adoption of the names as interpreted by himself.

1942. COLLIN, J. E. *Ent. mon. Mag.*, 78 : 97-103.

Collin attacks Stone's validation of the 1800-names. His main contention is that they cannot be validated under Op. 46. He draws attention to the foot-note in the original paper that was omitted in Hendel's reprint.

1943. INTERNATIONAL COMMISSION ON ZOOLOGICAL NOMENCLATURE. *Bull. Zool. Nomcl.*, 1 : 14-15.

The Commission agree to render Opinion 152.

1944. GORRE, E. R. *Ent. mon. Mag.*, 80 : 109-117.

This paper includes some brief comments on the situation relating to the Meigen 1800-names.

194.— **INTERNATIONAL COMMISSION ON ZOOLOGICAL NOMENCLATURE.** Opinion 152. The Commission at 41, Queen's Gate (London).

This will have to be read in full by any one who proposes to say anything further upon the subject of the 1800-names. It is the outcome of Edwards's questionnaire and the *ultra vires* resolution of the International Congress.

**XXX.**—*Distribution of Lepus victoriae victoriae Thomas*, Ann. & Mag. Nat. Hist. (6) xii. 1893, p. 268: Nassa, Speke Gulf, South Eastern Lake Victoria, Tanganyika Territory.

ALLEN, in his "Check List of African Mammals," Bull. Mus. Comp. Zool. lxxxiii. 1939, p. 279, gives no distribution for this hare other than the type-locality, and gives two other races from Kenya Colony and the Southern Sudan. It may therefore be of interest to record that in 1928 I saw two large grey hares on Ihila, 4600 feet A.S.L., near the Nsiamu crossing of the Sindi, this crossing being sixteen miles south of Malagarasi Station on the Central Railway Line (Kigoma-Dar-es-Salaam) in western Tanganyika Territory. I was surveying and mapping this high ridge when these hares rose from the rocks close under my feet, but unfortunately I was not carrying a gun at that moment or could have obtained both of them for the collection of the British Museum (Natural History).

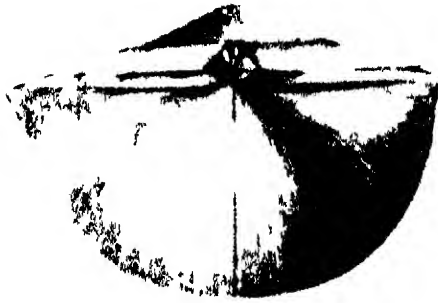
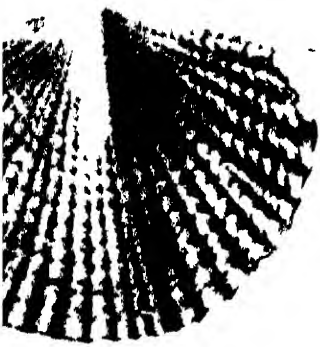
I have no doubt they were *Lepus victoriae* and most probably the typical race, although Ihila is about two hundred and eighty miles from Nassa. These were the only grey hares I saw throughout my travels in the Bukoba, Kibondo, Kasulu, Kigoma, Tongwe and Ubende areas, and they can therefore be considered as uncommon.

C. H. B. GRANT.

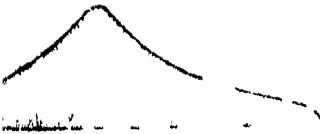
The Publishers regret to announce the death of  
Mr. John R. Norman, F.L.S., one of the Conductors  
of the 'Annals and Magazine of Natural History.'



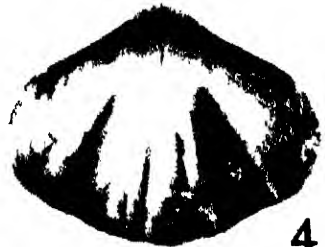




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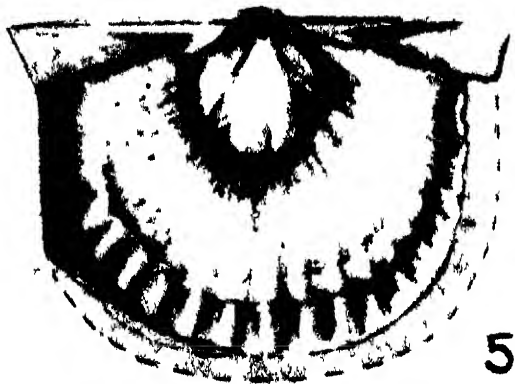
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# THE ANNALS AND MAGAZINE OF NATURAL HISTORY.

[ELEVENTH SERIES.]

No. 77. MAY 1944.

XXXI.—*Notes on Polyzoa (Bryozoa).*—I. *Umbonula verrucosa auctt.*: *U. ovicellata*, *sp. n.* and *U. littoralis*, *sp. n.*  
By ANNA B. HASTINGS, M.A., Ph.D., British Museum  
(Natural History).

## *Introduction.*

The work published in this series of papers has been done at various times over a number of years. It has been completed and prepared for press since the war started, and, as important parts of the collections and library of the British Museum are stored for safety, there are a few instances where the book or specimen needed for some particular point was not available. All such instances are noted in the text.

British Museum registration numbers, consisting of four numbers separated by full-stops, *e. g.* 1942.5.10.7, are quoted throughout the papers without further explanation. Where it seemed to be useful they have been quoted in the statements of distribution. Elsewhere the names of the authorities for published records have been regarded as sufficient.

## *Umbonula verrucosa auctt.*

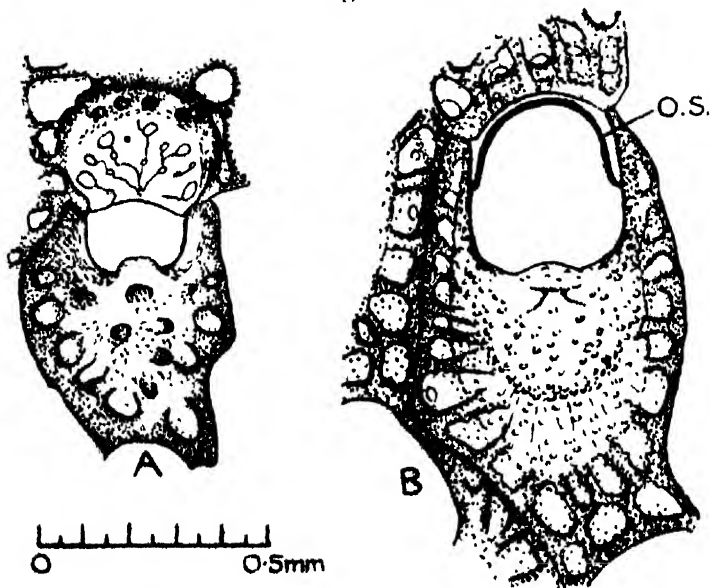
Hincks (1880, p. 318) used the name *Umbonula verrucosa* (Esper) for both a littoral and a deeper-water form found on the British coasts, but noted a number of differences between them. He mentioned that he had never found ovicells on the littoral form. This was explained when, shore-collecting at Plymouth in August 1928, I obtained fertile colonies in which most of the zoecia in certain parts of the colony had embryos in the body-cavity,

although they had no ovicells and showed no external difference from the non-fertile zoecia \*. In association with the differences in the external appearance of the littoral and deeper-water forms enumerated by Hincks, and to be seen in material in the British Museum, this difference in the reproduction convinces me that they are distinct species.

The differences in external appearance between the two species may be summarized as follows:—

The deeper-water species is the more heavily calcified, and this leads to greater differences between the zoecia

Fig. 1.



- A. *Umbonula ovicellata*, sp. n., Britain, 11.10.1.1555 A. Holotype. One rather heavily calcified, fertile zoecium, and a few of the areolæ of neighbouring zoecia. Compare figs. 2 A, B, which show non-fertile zoecia and a younger fertile zoecium from the same colony.
- B. *Umbonula littoralis*, sp. n., Drake's Island, Plymouth, 30.1.3.6. Holotype. One fertile zoecium with a few areolæ of neighbouring zoecia and part of one neighbouring orifice. The opercular sclerite is indicated to show the relation of the orifice to the edge of the frontal shield.

The suture-like meeting with the frontal shield of the distal zoecium on each side of the orifice is characteristic of all the zoecia both fertile and non-fertile.

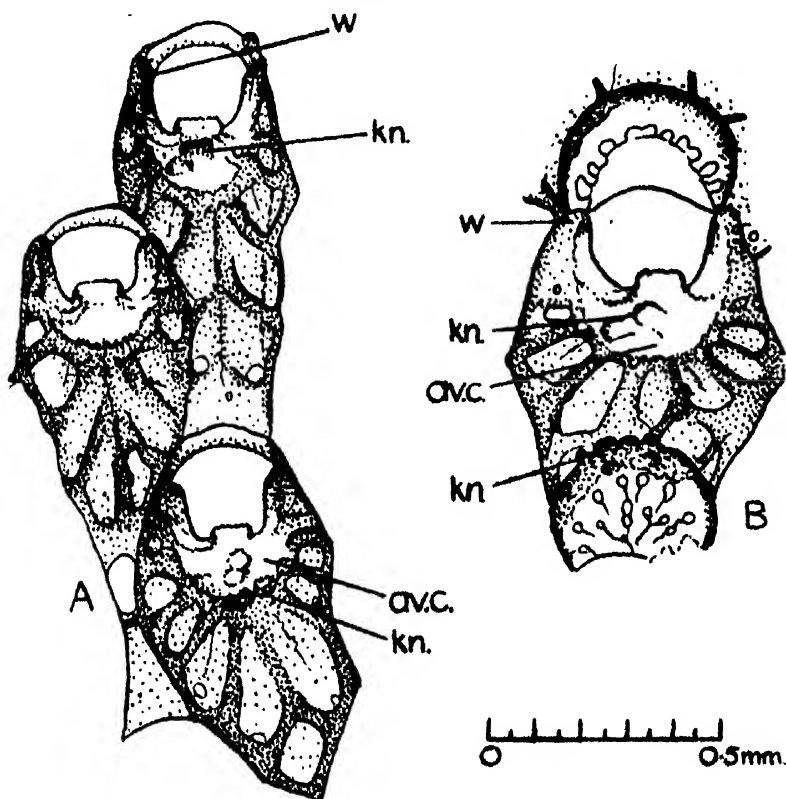
*o.s.*, opercular sclerite.

\* It is perhaps worth noting, as information about the breeding-season, that in a small quantity of littoral material collected at Plymouth in June, 1933, the zoecia contained no embryos, but considerable quantities of spermatogenic tissue.



of different ages in the same colony than are seen in the littoral species. The secondary calcification becomes thick and rough, and bears knobs and processes around the ovicell, on the umbo, and on the ribs (figs. 1 A, 2 A and 2 B). The calcareous walls of the littoral

Fig. 2.



*Umbonula ovicellata*, sp. n., Britain, 11.10.1.1555 A. Holotype.

A. Three non-fertile zoecia. B. A young fertile zoecium with its own incomplete ovicell, the ovicell of the proximal zoecium, and the ribs of the areole of the distal zoecium. For an older fertile zoecium from the same colony see fig. 1 A.

ov.c., crescentic avicularian chamber; kn., knobs on secondary thickening of frontal shield and ovicell; w., "wing."

species may become finely granular (fig. 1 B), but very rarely become thick or rough, and knobs and processes are very seldom formed\*. In the deeper-water species there

\* The only specimens I have seen with heavy calcification are from Plymouth (June 1930, 1943.4.6.1, see p. 280), and Bergen Fiord (11.10.1.1560 A).

are 6-12 areolæ and the ribs between them usually reach the umbo, though they are very variable and irregular in their arrangement and may meet a median longitudinal rib. In the littoral species the areolæ are more numerous, numbering 14-20, the ribs are usually regularly radiating, they rarely reach the umbo, and may be very short. In both species the umbo is variable, and it also changes in appearance with increasing calcification and with wear, but the difference in outline of the part overhanging the orifice, suggested by figs. 1 A and B and by Hincks's figures, is quite characteristic. In both species any areolæ developed along the proximal border of the zoecium are built up against the distal border of the orifice of the proximal zoecium, as shown in fig. 1 B, but in the littoral species they are numerous and well developed, while in the deeper-water species these proximal areolæ are commonly poorly developed. The difference shown in figs. 1 A, 2 A and 1 B is thus quite characteristic though not absolute.

On the other hand, there is no discernible difference between the mandibles of the two species. In both they are semicircular, or a little longer than the radius of the semicircle, the sides then being straight or slightly convex; the margin is denticulate, and there is an oval lucida centrally and a pair of oblique sclerites (see Waters, 1885, pl. xiv. fig. 19).

As has for long been recognized, the species called *Cellepora verrucosa* by Esper (1790) is clearly distinct from *C. verrucosa* Linn. (1767)\*. The name *Umbonula* (*Cellepora*) *verrucosa* (Esper), which has been used hitherto for the two species discussed here, is thus pre-occupied, and is not available for either species. I therefore introduce the names *Umbonula ovicellata* and *U. littoralis* for the ovicellate and littoral species respectively. *U. ovicellata* may well be the species intended by Esper.

In preparing the distribution statements I have not been able to attribute all records to one or other of the two species. Joliet (1877, p. 290) gives no details of the form recorded by him from Roschff as *Lepralia verrucosa*, but its habitat appears to be similar to that occupied by *Umbonula littoralis* on the opposite side of the English

\* *C. verrucosa* Linn. appears to be a *Cellepora* in the modern sense. Jelly (1889, p. 56) gives it as a synonym of *C. pumicosa* Linn.

Channel. On the other hand, the specimens from Cherbourg recorded by Pergens (1889) were dredged from deeper water\*.

Calvet (in Jullien and Calvet, 1903, pl. xvii. figs. 7 a, b), shows an operculum and a mandible from material from the Azores, of the same general type as those found in both *U. ovicellata* and *U. littoralis*. The operculum appears, however, to be larger than is found in either species.

It seems unlikely that the form from South Georgia recorded by Calvet (1904, p. 31) as *U. verrucosa* belongs to either *U. ovicellata* or *U. littoralis*, but no description is given and I have not seen his material.

Some other records remaining uncertain are :—Wick and Peterhead (Hincks, 1880), Scotland (Busk, 1854), Dublin Bay (Thompson, 1844, p. 440), and several arctic and boreal records (see Borg, 1933, p. 539).

Nordgaard (1918, p. 80) considered that all statements of the occurrence of *U. verrucosa* north of the Lofoten Islands were doubtful. Some of the localities listed by Borg extend the distribution a little to the north of Nordgaard's limit.

Canu and Bassler (1920, p. 494), having apparently overlooked Hincks's statement that his figures represented the littoral and deeper-water forms, reproduced them as "ordinary zoecia" and "ovicelled zoecia," and included the characters of the ovicell in their definition of the genus.

A specimen of *Umbonula patens* (Smitt, 1867, p. 22; Borg, 1933, p. 539) in the Busk Collection (99.7.1.1779) comes from Parry's Island, Spitzbergen, and appears to have been sent to Busk by Smitt. In addition to the features noted by Nordgaard (1918, p. 80), it differs from both *U. ovicellata* and *U. littoralis* in the form of the avicularian chamber, which is larger and more oval in outline, extending further towards the proximal end of the zoecium.

*Umbonula ovicellata*, sp. n. (Figs. 1 A, 2 A, B.)

? *Cellepora verrucosa* Esper, 1790, p. 239, pl. *Cellepora* II. figs. 1, 2.

Not *Tubipora verrucosa* Linnaeus, 1758, p. 789; *Cellepora verrucosa* Linnaeus, 1767, p. 1286.

? *Lepralia reticulata* Couch, 1844, p. 117, pl. xxii. fig. 9.

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\* Pergens's paper not being available to me at present, this information is taken from Calvet (1902, p. 53).

*Lepralia verrucosa* (part) Johnston, 1847, p. 316 (no figure, but one of Johnston's specimens was figured by Busk); Busk, 1854, p. 68, pl. lxxxvii. figs. 3, 4, pl. xciv. fig. 6.

*Lepralia verrucosa* Heller, 1867, pp. 99, 103.

*Discopora verrucosa* (part ?) Gray, 1848, p. 126.

*Umbonula verrucosa* (part) Hincks, 1880, p. 317, pl. xxxix. fig. 2.

*Umbonula verrucosa* Calvet, 1902, p. 52; Waters, 1924, p. 609, pl. xviii. fig. 14.

*Distribution*.—Guernsey (Hincks; Norman Coll. 11.10.1.1556 A); Cornwall (Johnston; Hincks); Budleigh Salterton (97.5.1.843); Sidmouth (Busk MS.); Swanage (Kirkpatrick Coll., 97.8.9.49); Britain (Gray; Norman Coll., 11.10.1.1555 A, 1558 A); Cette (Calvet); Rapallo (Waters); Naples (Waters; specimens from Waters, 81.4.29.17 and 97.5.1.842); Adriatic (Heller; Hincks Coll., 99.5.1.444; Norman Coll. from Heller, 11.10.1.1557 A); Gibraltar (Busk Coll. from Landsborough, 99.7.1.1750).

*Holotype*.—Britain, 11.10.1.1555 A.

*Remarks*.—The identity with Esper's species was queried by both Busk and Hincks. Esper's figure shows zoecia with rather regularly radiating ribs extending to the base of the umbo, which may be flanked by smaller projections, such as I have seen in some Mediterranean specimens of *U. ovicellata* (described below) but not in *U. littoralis*. Ovicells are not shown, and there are radiating lines that might represent spines, but *U. ovicellata* may well be the species intended by Esper (see p. 276), whose material came from the Mediterranean.

Busk's figures appear to represent relatively young zoecia near the edge of the colony (pl. lxxxvii. figs. 3, 4) and older highly calcified zoecia (pl. xciv. fig. 6). According to Busk's inscriptions on his drawings, pl. xciv. fig. 6 represents a specimen from Sidmouth obtained from Dr. Greville, and figs. 3 and 4 in pl. lxxxvii. were drawn from one of Johnston's specimens (47.9.16.28). This was the specimen *b*, on wood, of Gray (1848, p. 126). It must be British, as it is included in the works of Johnston and Gray, but no more precise locality is given. The specimen is not at present accessible for examination.

In the specimen from Budleigh Salterton the calcification is extreme, and the knobs and processes are numerous and may be quite long, or thick and blunt.

Waters's two specimens from Naples may be part of the material recorded by him (1879, p. 37) as *Lepralia verrucosa*,

but the slide (79.4.25.19) deposited in the British Museum as representing that collection is not at present accessible. The highly-developed wing-like projections at each side of the orifice in these specimens, shown rather diagrammatically in Waters's figure (1924), may be represented by Esper in his zoecia with tridenticulate orifice. They give the specimens a somewhat unusual appearance, which is more marked because the colonies are glistening and relatively lightly calcified. Similar projections are to be seen in some zoecia of Hincks's specimen from the Adriatic and in Norman's specimens from Britain. The ovicells of the Naples material are immature, but show the frontal pores. The mandible in Waters's figure has concave sides, although his earlier figure (1885, pl. xiv. fig. 19), of a mandible from a specimen from Naples, shows the typical, nearly semicircular mandible, with straight or slightly convex sides. A mandible mounted by me from his Naples material has the typical form, and I think he may have been misled when he drew his later figure. I have myself seen an instance where the light caught an open mandible of *U. ovicellata* in such a way as to give an illusion of concave sides.

Johnston gave *Lepralia reticulata* Couch as a synonym of *L. verrucosa* (Esper), and this synonymy was quoted by Gray, Busk and Hincks. There is no evidence that Johnston saw Couch's material. He gave Peach as the source of his Cornish records. I have been unable to consult Couch's work, but Sir Sidney Harmer has very kindly provided me with a tracing of pl. xxii. fig. 9, together with a diagrammatic enlargement of what can be seen in a single zoecium in that figure. From this it is clear that *L. reticulata* is distinct from the form for which I propose the name *U. littoralis*. Couch's figure might, however, be a poor representation of *U. ovicellata*. In some colonies of that species (11.10.1.1555 A) some narrow zoecia are seen (text-fig. 2 A) in which there is a median longitudinal rib into which parallel and oblique ribs run from each side \*, as in *L. reticulata*. Assuming that the circular structures shown in Couch's figure are not pores but the knobs and protuberances that appear in *U. ovicellata* with

\* A comparable arrangement is very occasionally to be seen in narrow, abnormally-shaped zoecia of *U. littoralis* (e. g. in a specimen from Plymouth described below, p. 286, and one zoecium in the specimen from Jersey, 99.7.1.1755).

increasing calcification, the enlarged sketch much resembles that species. Johnston's statement that Peach had found *L. verrucosa* near low-water mark and also in deep water shows that both species must have been known from Cornwall by about the time when Couch was working.

Harmer (1902, p. 332, footnote) foresaw that the Mediterranean species might prove to be distinct from the littoral form common on the south coast of England.

*Umbonula littoralis*, sp. n. (Fig. 1 B.)

*Lepralia verrucosa* (part) Johnston, 1847, p. 316, pl. lvi. fig. 3; Busk, 1854, p. 68 (no figure).

*Umbonula verrucosa* (part) Hincks, 1880, p. 317, pl. xxxix. fig. 1.

*Umbonula verrucosa* Harmer, 1902, pp. 293, 331, pl. xv. fig. 11.

*Distribution*.—Jersey (Busk Coll., 99.7.1.1758); Scilly Isles (Vine Coll., 34.10.24.18); Cornwall (Johnston; Hincks; Hincks Coll., 99.5.1.445); Plymouth (Harmer; Hastings Coll., 30.1.3.6; 1942.5.16.2; 1943.4.6.1); Ilfracombe (Hincks); Isle of Man (Lomas Coll., 86.1.9.6); Scarborough (Johnston; Busk; Busk Coll., 99.7.1.1759, 1434); Northumberland (Hincks); St. Andrews (Hincks); Shetland (Hincks); Britain (Norman Coll., 11.10.1.1552 A; Hardanger Fiord (Norman Coll., 11.10.1.1559 A); Bergen Fiord (Norman Coll., 11.10.1.1560 A).

*Holotype*.—Drake's Island, Plymouth Sound, August 1928, 30.1.3.6.

*Remarks*.—The umbo is variable and may be much more developed than in the figured zoecium, projecting frontally as a conical boss with the avicularium at its base. In a specimen collected at Plymouth in June 1930 (1943.4.6.1), with umbones of this type, the calcification approaches that of *U. ovicellata*, the ribs being pronounced and reaching the umbo, and a few knobs and coarse granulations being developed. The colony also resembles *U. ovicellata* in having a few zoecia in which the ribs run to a median longitudinal ridge, but these are exceptionally narrow zoecia and the arrangement is clearly related to their deformity. In the number of its areolae, the shape of its umbo, the size of its orifice and the absence of ovicells this specimen agrees with *U. littoralis*, to which it clearly belongs.

The frontal shield normally extends over the aperture so that its distal border bearing the umbo overhangs the

operculum, but zoecia are sometimes seen in which a shield, though fully formed and undamaged, as indicated by its complete umbo and unbroken distal edge, is relatively short, leaving part of the frontal membrane uncovered (e. g. 30.1.3.6 A, Plymouth). A specimen (11.10.1.1553 A) labelled by Norman as "with immense mouth" may be a more extreme example of this. In it the shield only covers a small part of the frontal membrane, leaving an oval aperture which may be twice as long as broad. The edge of the shield usually appears complete and undamaged, but an umbo is only present in a few zoecia.

The Johnston Collection is not at present accessible, but as Johnston figured *U. littoralis* there is presumably at least one specimen of it in his collection.

Busk's figures all represent *U. ovicellata*, but his specimens from Scarborough belong to *U. littoralis*. The works of Thompson and Gray, quoted by Busk, merely record the species without description, and the specimens are not at present accessible. One of those recorded by Gray (Johnston Collection) is, however, known to be the original of two of Busk's figures of *U. ovicellata* (see p. 278).

Thompson, Johnston, Gray and Busk all quote a manuscript name, *Lepralia johnstoni* Bean, and it is of some interest to find that one of Busk's specimens of *U. littoralis* from Scarborough (99.7.1.1434) is labelled:— "*Lep. verrucosa* Johnst., *L. Johnstoni* Bean, *Umbonula verrucosa* Hincks. Scarboro'. Sent by Mrs. Bean to Dr. Johnston. J. E. Gray."

Waters (1924, p. 609)\*, who overlooked Harmer's statement that his material came from Plymouth (1902, p. 345), doubted Harmer's identification because he stated (p. 332) that the lateral shoulders or wings carried avicularia. Harmer's sentence goes on to say that the shield "may support a median avicularium," a feature which he describes as constant on p. 294. Further

\* It is difficult to see why Waters supposed that *Micronella soulieri* (Calvet, 1902, p. 61, pl. ii. figs. 3, 4) might be confused with *U. verrucosa* [a. lat.] from which it differs in the punctured frontal wall, without ribs or marginal areolae, in the absence of an avicularium on the median umbo, in the presence of lateral avicularia, in the presence of spines, and probably in other characters such as the sculpture of the ovicell and the form of the operculum.

comparison with his remarks on pp. 293–296 suggests that on pp. 331–332 he intended a generalization on the genus covering *U. pavonella* (Alder), see below, as well as *U. verrucosa*. His description of *U. verrucosa* (pp. 293–294) leaves no doubt that he had *U. verrucosa* in Hincks's sense. The large number of areolæ shows that Harmer's figure represents *U. littoralis* rather than *U. ovicellata*, and he states (p. 332, footnote) that he has used the name *U. verrucosa* for "the littoral form common on the south coast of England". The "prominent shoulder" mentioned in the text (p. 294), however, suggests *U. ovicellata*. Possibly the description was meant to cover both forms.

### *Distribution.*

Although both species are found on the south-west coast of Britain, there is a definite difference in their known geographical range, *U. littoralis* extending at least as far north as the Bergen Fiord (see p. 280) and not being known from the Mediterranean, while *U. ovicellata* is known chiefly from the Mediterranean, where it extends into the littoral zone (see Waters, 1924, p. 610), but is not known from any locality north of Cornwall, South Devon and Dorset (see p. 278).

A third species of *Umbonula* is found on the coasts of Britain, namely *U. arctica* (Sars) = *U. pavonella* (Alder): see *Mucronella pavonella* Hincks, 1880, p. 376, pl. xxxix. figs. 8–10, and *Discopora arctica* Nordgaard, 1918, p. 79. This arctic species has been found at points on the north-east coast of Britain from the Shetland Islands to Scarborough\*.

Thus, the British fauna includes an arctic species extending southwards to the north-east coast of Britain, a boreal species extending as far south as the English Channel, and a Mediterranean species extending northwards to the south-west coast of Britain.

### *Summary.*

The British *Umbonula verrucosa* of Hincks and other authors comprises two species, a littoral one with internal

\* British specimens of *U. arctica* (Sars) in the British Museum:—Shetland Islands (Norman Coll. 11.10.1.1563 A); St. Andrews (Norman Coll. 11.10.1.1562 A); N.E. Coast of Britain (Busk Coll. from Alder, 99.7.1.1803); off Durham Coast (Norman Coll. from Alder, 11.10.1.1561 A); Cullercoats (Busk Coll. from Alder, 99.7.1.1804, 1806, 1809); Scarborough (Alder, 63.9.16.8).



ovisacs and a deeper-water species with ovicells. As the name *Cellepora verrucosa* Esper is preoccupied by *C. verrucosa* Linn., these species are described as *Umbonula littoralis*, sp. n. and *Umbonula ovicellata*, sp. n. The synonymy of some of the earlier records of *U. verrucosa* has been determined. Three British species of *Umbonula* are known, each with a different geographical range.

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XXXII.—*New or little-known Tipulidæ (Diptera).*—LXX. *Neotropical Species.* By CHARLES P. ALEXANDER, Ph.D., F.R.E.S., Massachusetts State College, Amherst, Massachusetts, U.S.A.

THE crane-flies discussed herewith are all from Peru, where they were collected by Messrs. Pedro Paprzycki, J. Adger Smyth, and Felix Woytkowski, to whom my sincere thanks are due for the privilege of retaining the types in my personal collection.

*Pectinotipula titicacæ*, sp. n.

General coloration grey, the præscutum with four darker grey stripes, the interspaces with conspicuous dark setigerous punctures; flagellum beyond the basal segment uniformly black to brownish black; tips of femora blackened; wings variegated light brown and whitish subhyaline, the latter colour including a broad central stripe that reaches the wing-tip in cell  $R_5$ ; abdominal tergites yellow, trivittate with brown; male hypopygium with the inner dististyles and gonapophyses larger and more complicated than in *argentina*.

*Male*.—Length about 17 mm.; wing 19 mm.; antenna about 6.5 mm.

Frontal prolongation of head light brown, grey pruinose above; nasus conspicuous; palpi black. Antennæ with proximal three segments yellowish brown; succeeding segments with basal enlargements and branches black, the apical pedicels brown to brownish black; outer segments uniformly black; scape only about one-fourth as long as the first flagellar segment; flagellar branches approximately as long as the segments. Head grey; vertical tubercle scarcely indicated; anterior vertex broad, nearly five times the diameter of scape.

Pronotum grey, with a restricted, dark brown median dash. Mesonotal præscutum with the ground-colour light grey, with

four darker grey stripes, the intermediate pair separated by a capillary bright brown line; lateral stripes with their outer portions still darker; a more or less distinct darkened area in humeral field, best shown from above; setigerous punctures of interspaces conspicuous; posterior sclerites of notum light grey, the scutal lobes variegated by darker grey. Pleura grey, the dorsopleural membrane yellow. Halteres relatively elongate, stem obscure yellow, knob dark brown. Legs with coxæ grey pruinose; trochanters yellow; femora yellow, the tips conspicuously blackened; tibiæ yellowish brown, darkened outwardly; tarsi passing through dark brown to black; claws simple. Wings with the ground-colour light brown, variegated by slightly brown and whitish subhyaline, the latter colour chiefly evident as a central brightening that reaches the wing apex in cell  $R_5$ , further involving the adjoining portions of cells  $M_1$ , 2nd  $M_2$  and  $M_3$ , as well as all of cell 1st  $M_2$ ; basad of the cord the white occurs especially in cells  $R$  and  $M$  adjoining vein  $M$ , and in the bases of both anal cells; prearcular field, cells  $C$  and  $Sc$ , and stigma uniform brown; the remaining brown colours especially evident in outer radial and medial cells, cell  $M_1$  and outer portions of anal cells; veins brown. Venation:  $R_{1+2}$  entire;  $R_s$  a little less than twice  $m-cu$ ; cell 1st  $M_2$  relatively long;  $m$  shorter than the petiole of cell  $M_1$ .

Abdominal tergites yellow, with three brown stripes that are not well indicated at base of organ, becoming more extensive and evident outwardly, on the subterminal segments being about as extensive as the yellow ground; sternites yellow, with a median brown stripe that is broadly broken at bases of segments; hypopygium yellow. Male hypopygium of the general type of *argentina*, differing in the details. Lateral lobes of ninth tergite shorter. Inner dististyle with the head much larger, including not only a more produced beak but a conspicuous blackened knob on the posterior portion. Gonapophyses larger and more complicated.

*Hab.* Peru (Puno).

*Holotype*, ♂, Chucuito, vicinity of Lake Titicaca, altitude about 12,500 feet, February 21, 1939 (*Smyth*).

*Pectinotipula titicacæ* is well distinguished from the genotype and only other described species, *P. argentina* (van der Wulp), by the diagnostic characters listed, especially the blackened flagellum, wing-pattern and venation, and structure of the male hypopygium. It appears that there are still other

species of the genus to be described, since I have further atermial from the Andes of Argentina and Bolivia.

*Tipula (Nephrotomodes) volens*, sp. n.

Allied to *spinicauda*; general colouration of mesonotum almost uniform greyish brown; pleura yellow; legs black; wings with a brownish tinge, the costal border darker brown; *m-cu* long; abdomen with a blackened subterminal ring; male hypopygium with the lateral angles of tergite produced into long flattened arms that are slightly expanded at tips, the entire caudal margin of tergite provided with a continuous series of blackened spinous setæ; appendage of eighth sternite an oval setuliferous cushion.

*Male*.—Length about 15 mm.; wing 16 mm.; antenna about 7.6 mm.

Rostrum brownish yellow; nasus short and stout; palpi brownish yellow. Antennæ (male) relatively long, as shown by the measurements; scape and pedicel yellow, flagellum black, the extreme base of first segment obscure yellow; flagellar segments elongate with poorly indicated basal enlargements; longest verticils unilaterally distributed, shorter than the segments. Head medium brown, the front and narrow orbits yellow; no vertical tubercle; anterior vertex about three times the diameter of scape.

Pronotum obscure brownish yellow. Mesonotum almost uniform greyish brown, the præscutum with the stripes very poorly differentiated, best shown by the posterior portion of the median vitta; humeral region a little more pruinose; pleurotergite yellow, the anapleurotergite with its posterior half more pruinose. Pleura yellow. Halteres with stem reddish brown, knob brownish black. Legs long and slender; coxæ and trochanters yellow; remainder of legs black, the extreme bases of femora yellow; claws with a conspicuous tooth. Wings with a brownish tinge, the stigma, costal field and wing-base all uniformly and continuously darker brown; very vague washes on anterior cord and along vein *Cu*; very restricted oblitative areas before stigma and across cell 1st *M*<sub>2</sub>, the latter barely encroaching on the adjoining cells; veins brown. No squamal setæ; trichia of veins reduced in number, there being none on *M* or its branches. Venation: *Rs* moderately long, about one-fifth longer than the unusually long *m-cu*; *R*<sub>1+2</sub> preserved; petiole of cell *M*<sub>1</sub> a trifle longer than *m*; *m-cu* fully four-fifths the length of distal section of

$Cu_1$ , cell  $M_4$  thus conspicuously widened at base ; cell 2nd  $A$  moderately wide.

Abdomen with basal tergites dark brown, the succeeding ones somewhat more reddish brown ; sternites yellow ; a subterminal black ring ; hypopygium yellow. Male hypopygium generally as in *spinicauda* but differing in all details. Ninth tergite transverse, each lateral angle produced caudad into a long flattened arm, this gently widened or expanded at apex ; the caudal border of tergite thus appears as a very broad U-shaped emargination, narrowed to a linear incision at the mid-point, the entire margin provided with blackened spinous setae, the total number exceeding fifty to either side ; ventral armature of tergite a relatively short median club, its apex densely set with blackened spinous points. Inner dististyle with the rostrum unusually long and slender, a direct prolongation of the dorsal margin of style. Gonapophyses appearing as slender, pale rods, shorter than the aedeagus. Appendage of eighth sternite an oval setuliferous cushion or lobe, its edge at near mid-length produced into two slender setuliferous fingerlike lobules.

*Hab.* Peru (Huanuco).

*Holotype*, ♂, Afilador, altitude 670 metres, in jungle, May 4, 1937 (*Woytkowski*).

The closest described relative of the present fly is *Tipula* (*Nephrotomodes*) *spinicauda* Alexander, of Panama, which differs especially in the details of structure of the male hypopygium. In this fly, the tergal arms are narrowed gradually to subacute points, while the appendage of the eighth sternite is a deeply bilobed structure, each long-oval flattened lobe produced into a long, slender, glabrous rod, the apex of which bears several microscopic points.

(*Tipula* (*Nephrotomodes*) *insolabilis*, sp. n.

Size small (wing, male, about 8 mm.) ; general coloration of head and thorax light grey ; wings with a weak brownish tinge, conspicuously patterned with dark brown, especially along the costal border to the wing-tip in the outer radial field ; vein  $R_{1+2}$  entirely atrophied ; cell 2nd  $A$  very narrow ; abdominal tergites chiefly blackened, sternites yellow ; male hypopygium with the caudal margin of tergite with a U-shaped notch ; dististyles simple, the inner style beyond mid-length bent at a right angle into a long slender beak ; appendage of ninth sternite entirely pale, bilobed ; eighth sternite unarmed ;

ovipositor with cerci unusually small, appearing as oval lobes.

*Male*.—Length about 8 mm. ; wing 8 mm. ; antenna about 4.5 mm.

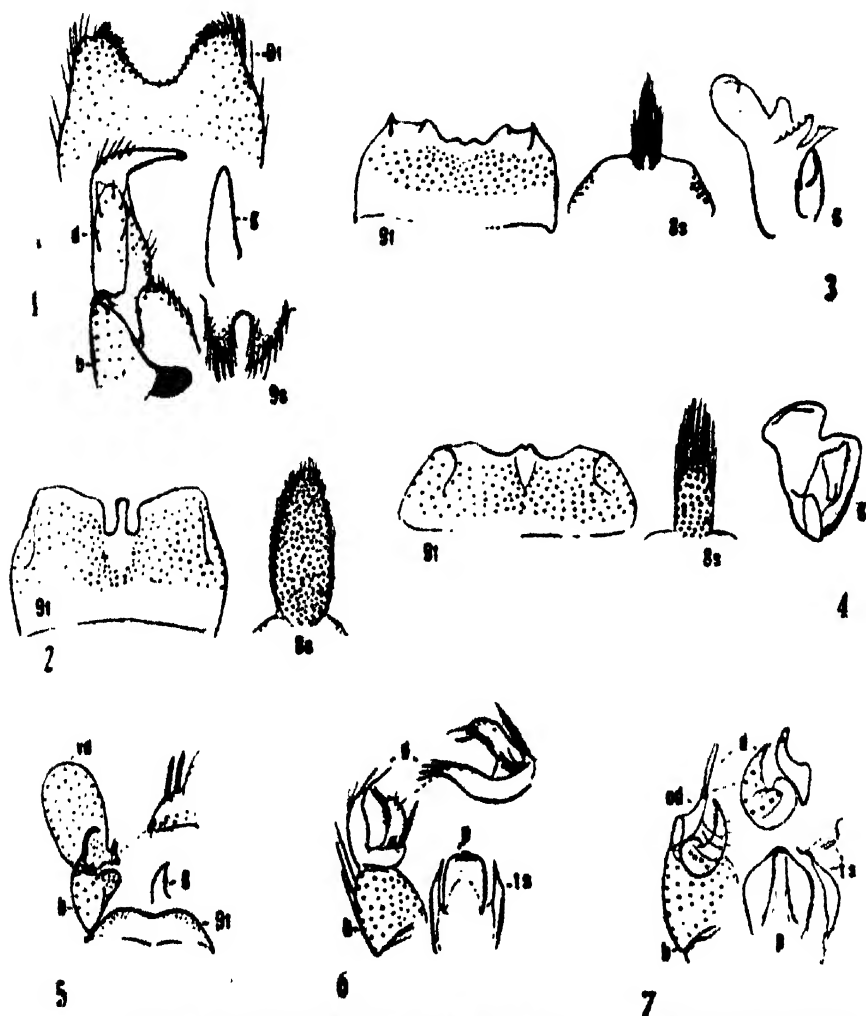
*Female*.—Length about 12 mm. ; wing 11.5 mm.

Frontal prolongation of head brownish yellow, darker above and at apex ; nasus lacking ; palpi dark brown. Antennæ (male) elongate ; scape and pedicel yellowish brown, flagellum black ; flagellar segments elongate, moderately incised, the longest verticils much shorter than the segments. In female, antennæ shorter, weakly bicoloured, the flagellar segments black with pale apices. Head light grey ; anterior vertex wide in both sexes, without tubercle.

Pronotum and mesonotum light grey, the præscutum with four darker, more leaden grey stripes that are poorly defined against the ground, more or less confluent behind ; scutal lobes somewhat similarly darkened. Pleura light grey, slightly darker on anepisternum and ventral sternopleurite ; dorsopleural region slightly more buffy. Halteres with knob blackened, the stem paler. Legs with the coxæ grey ; trochanters obscure yellow basally, passing into brown, the tips very narrowly still darker ; tibiæ yellowish brown, the tips narrowly darkened ; basal segments of tarsi pale brown, the outer segments blackened ; claws simple. Wings with a weak brownish tinge, conspicuously patterned with dark brown, including the prearcular field, cells *C* and *Sc*, and the stigma ; outer radial cells extensively clouded with somewhat paler brown ; cord very narrowly and insensibly seamed with brown ; veins dark brown. Squama without setæ. Venation :  $R_{1+2}$  entirely atrophied ;  $R_s$  slightly longer than  $m-cu$ , arcuated at origin ; petiole of cell  $M_1$  a trifle longer than  $m$  ; cell 2nd *A* very narrow.

Abdominal tergites (male) chiefly black, the second segment restrictedly more reddened at mid-length, the third similarly coloured at base ; subterminal segments uniformly blackened to form a ring ; sternites and hypopygium yellow ; in female, tergites reddish brown medially, conspicuously blackened laterally, the sixth and seventh tergites uniformly black ; basal sternites and ovipositor orange-yellow, the intermediate sternites darker. Ovipositor with valves exceedingly short and fleshy, the cerci reduced to small oval lobes. Male hypopygium (fig. 1) with the ninth tergite, 9t, relatively large, the caudal margin with a broad U-shaped notch ; lateral lobes moderately obtuse, the outer margins with very long setæ, the mesal

edges of the lobes with much shorter but abundant bristles. Basistyle, *b*, on mesal face with a blackened oval lobe set with abundant tubercles. Dististyles, *d*, of very simple structure,



- 1.—*Tipula (Nephrotomodes) insolabilis*, sp. n. ; male hypopygium.  
 2.—*Tipula mediocentata*, sp. n. ; male hypopygium.  
 Fig. 3.—*Tipula callothrax*, sp. n. ; male hypopygium.  
 Fig. 4.—*Tipula callisto*, sp. n. ; male hypopygium.  
 Fig. 5.—*Limonia (Geranomyia) tulumayensis*, sp. n. ; male hypopygium.  
 Fig. 6.—*Neognophomyia paprzyckiana*, sp. n. ; male hypopygium.  
 Fig. 7.—*Neognophomyia bisetosa*, sp. n. ; male hypopygium.

(Symbols : *b*, basistyle ; *d*, dististyle ; *g*, gonapophysis ; *od*, outer dististyle ; *p*, phallosome ; *s*, sternite ; *t*, tergite ; *ts*, tergal spine ; *vd*, ventral dististyle.)

the outer a somewhat flattened lobe. Inner style with basal portion greatly flattened, covered with abundant setulæ and

fewer strong bristles and setæ; beyond mid-length narrowed and bent at a right angle into a long slender beak. Gonapophyses, *g*, appearing as simple flattened pale blades, their tips narrowly obtuse. Ninth sternite with its appendage, *9s*, consisting of two pendant entirely pale lobes provided with abundant, very long pale setæ. Eighth sternite transverse, its caudal margin truncate or virtually so, without armature.

*Hab.* Peru (Huanuco).

*Holotype*, ♂, Afilador, altitude 670 metres, in jungle, June 15, 1937 (*Woytkowski*). *Allotopotype*, ♀, with the type

A very distinct species that seems closest to *Tipula* (*Nephrotomodes*) *perangustula* Alexander, despite the loss of vein  $R_{1+2}$  in the present fly. The details of coloration and structure of the male hypopygium are entirely distinct in the two flies.

*Tipula perjovialis*, sp. n.

Belongs to the *glaphyroptera* group; allied to *unistrata*; antennal flagellum strongly bicoloured; mesonotum grey, the præscutum with four brown stripes; legs yellow, the femora with a brown subterminal ring; tibiæ narrowly but conspicuously tipped with black, wings unusually variegated with brownish yellow, pale brown, dark brown and whitish subhyaline, the latter forming two conspicuous longitudinal stripes, the more cephalic of which extends the entire length of the wing; outer radial field brownish yellow, separated from the white central stripe by a dark brown border along vein  $R_{4+5}$ .

*Female*.—Length about 24 mm.; wing 19 mm.

Frontal prolongation of head obscure buffy yellow above, darker on sides; nasus long and slender; palpi black. Antennæ strongly bicoloured; basal three segments yellow to greenish yellow; succeeding segments bicoloured, the basal enlargements black, the apices more extensively yellow; terminal segments entirely black. Head buffy grey, more infuscated on sides behind; vertical tubercle low, entire.

Pronotum buffy grey, with a narrow median brown line. Mesonotal præscutum grey, with four brown stripes, the intermediate pair contiguous or virtually so, separated by a more or less distinct capillary black median vitta; cephalic portions of intermediate stripes paling to grey; lateral stripes crossing the suture on to the cephalic portions of the scutal lobes, the centres of the latter more extensively but less heavily infuscated; posterior sclerites of notum buffy, with a broad



continuous median stripe extending from the suture to the abdomen; mediotergite with a greyish area on either side of the caudal border. Pleura buffy, variegated with grey, especially distinct on the ventral sternopleurite, ventral meron, and anepisternum. Halteres with stem greenish yellow, knob weakly darkened. Legs with coxæ buffy yellow; trochanters yellow; femora yellow with a brown subterminal ring that is much more extensive than the yellow tip, the darkened ring of posterior femur somewhat paler; tibiæ pale yellow, the tips rather narrowly but conspicuously blackened; tarsi yellow, the tips of the proximal four segments very narrowly darkened; terminal segment blackened. Wings chiefly traversed by two longitudinal whitish subhyaline stripes, the more cephalic one beginning at arculus, reaching the wing-tip, including most of cells *R*, *M* and *R*<sub>1</sub>, all of 1st *M*<sub>2</sub>, most of *R*<sub>5</sub>, and the broad bases of cells *M*<sub>1</sub>, 2nd *M*<sub>2</sub>, and *M*<sub>3</sub>, the stripe bordered in front by a very conspicuous brownish-black line along vein *R*<sub>4+5</sub>, beginning at cord and extending to margin at end of vein *R*<sub>3</sub>, somewhat paler at its distal end; the major pale stripe above described is further bordered by a narrow line along the cephalic border of cell *R*, extending to the origin of *R*<sub>5</sub>, and posteriorly by a broad seam in the posterior half of cell *M* adjoining vein *Cu*, this becoming more intense and widened toward the cord, at near two-thirds the length of cell *M* sending a wash across the cell, more or less interrupting the white band; beyond the cord the dark band occupies most of the outer medial cells, which are variegated by paler centres and especially by a major white spot in each cell; a second longitudinal white stripe extends from the axillary region across mid-length of cell 2nd *A*, basal half of 1st *A*, and thence to margin in cell *Cu*, occupying more than the distal half of the latter; posterior borders of anal cells infuscated but variegated by pale streaks; prearcular field yellow; cells *C*, *Sc*, and outer radial field, with the stigma, pale brownish yellow, contrasting conspicuously with the darkened streaks behind; veins yellow, slightly darker in the clouded portions. Venation: *R*<sub>1+2</sub> entire; cell *M*<sub>1</sub> about twice its petiole; *m-cu* on *M*<sub>4</sub> shortly beyond origin of latter.

Abdomen obscure yellow, the basal tergites with three distinct dark stripes that become obsolete beyond the second segment; caudal borders of segments narrowly pale; abdomen with long conspicuous pale setæ. Ovipositor with cerci long and slender, dark brown, only gently upcurved.

*Hab.* Peru (Ayacucho).

*Holotype*, ♀, Yanamonte, La Mar, in fog forests, altitude 3000–4100 metres, October 1, 1941 (*Woytkowski*).

*Tipula perjovialis* is apparently most closely related to *T. unistriata* Alexander and a few nearly allied species, differing very conspicuously in the wing-pattern, which is more highly contrasted than in any other Tropical American species of the genus so far described.

*Tipula semivulpina*, sp. n.

Belongs to the *glaphyroptera* group; allied to *runtunensis*; general coloration yellow, scarcely patterned with darker; antennæ very strongly bicoloured; fore femora conspicuously infuscated, the tip yellow, enclosing a brown subterminal ring; wings strongly tinted with yellow, unpatterned; abdominal tergites yellow, with a more or less distinct brown median tergal stripe.

*Female*.—Length about 21 mm.; wing 17.5 mm.

Frontal prolongation of head obscure yellow above, abruptly blackened on sides, only slightly paler on ventral surface; nasus long and slender; palpi brownish black. Antennæ conspicuously bicoloured; basal three segments uniformly yellow, the succeeding segments with the basal enlargement darkened, the remainder yellow; longest verticils unilaterally arranged, much exceeding the segments in length; first flagellar segment subequal in length to the succeeding two combined. Head buffy yellow, feebly darkened on sides of posterior vertex; vertical tubercle low and entire.

Pronotum obscure yellow, faintly patterned with brown. Mesonotum yellow, the præscutum and scutum scarcely patterned with darker. Pleura uniform pale yellow to brownish yellow. Halteres yellow, the knobs more intensively darkened. Legs with the coxæ and trochanters yellow; fore femora strongly infuscated, the distal fourth yellow, enclosing a narrow brown subterminal ring that is a little more extensive than the pale tip; posterior femora more brownish yellow but patterned, as are the other legs; tibiæ and tarsi obscure yellow, the terminal tarsal segments blackened. Wings strongly tinted with yellow, unpatterned except for the more saturated yellow prearcular and costal fields, the stigma concolourous; vague dusky cloudings in outer ends of anal cells and base of *Cu*; a hyaline droplet in centre of cell 1st *M*<sub>2</sub>; veins pale yellow. Venation: *R*<sub>1+2</sub> entire; *R*<sub>s</sub> nearly twice *m-cu*; petiole of cell *M*<sub>1</sub>, a little longer than *m*.

Abdominal tergites yellow, the central portion more darkened to form a median stripe that is darker coloured and more concentrated on the outer segments; outer sternites somewhat similarly darkened; ovipositor with the elongate cerci reddish-horn colour.

*Hab.* Peru (Ayacucho).

*Holotype*, ♀, Yanamonte, La Mar, in fog forests, altitude 3000–4100 metres, September 2, 1941 (*Woytkowski*).

*Tipula semivulpina* is closest to *T. runtunensis* Alexander, of Ecuador, differing especially in the details of coloration. I am now uncertain that the female assigned to *runtunensis* in the original description actually belongs there. The strongly bicoloured antennæ of the present fly are very different from those of the male sex of *runtunensis*.

*Tipula mediodentata*, sp. n.

Belongs to the *monilifera* group; size large (wing 20 mm. or more); general coloration of mesonotum light grey to brownish grey, contrasting with the yellow pleura and pleurotergite; antennæ (male) relatively short, less than one-half the length of wing, the flagellar segments abruptly nodulose; wings fulvous brown, only slightly patterned with darker brown and more yellow areas; abdominal tergites yellow, narrowly trivittate with dark brown; male hypopygium with the ninth tergite large, notched medially and with a conspicuous median lobe from the base of this notch; lobe of eighth sternite long but broad, provided with numerous strong setæ.

*Male*.—Length 19–20 mm.; wing 20–22 mm.; antenna about 9–9.5 mm.

*Female*.—Length about 22–25 mm.; wing 21–24 mm.

Frontal prolongation of head above reddish brown, narrowly darkened on sides; nasus elongate; palpi black. Antennæ (male) unusually short for a member of the group, less than one-half the length of wing; scape, pedicel and first flagellar segment yellow, succeeding four or five segments yellow, with the very abrupt basal swelling black; outer segments with the pedicel passing through dark brown to black on the outer segments; verticils long and conspicuous. In female, antennæ short, the flagellar segments simple; basal four segments yellow, succeeding segments bicoloured, the outer ones uniformly blackened. Head above reddish brown, grey pruinose; a brown median streak on vertex.

Pronotum brownish grey behind, with a dark brown median line. Mesonotal præscutum light grey to brownish grey, with four darker brownish-grey stripes, together with an entire median brown vitta; interspaces more fulvous, with conspicuous black setigerous punctures; in cases, the interspaces are clear grey immediately before the suture; scutum clear grey, each lobe with darker brownish-grey areas; scutellum and postnotum grey, with a median brown vitta that is virtually continuous for the entire length of mesonotum; pleurotergite more reddish yellow, sparsely grey pruinose, more heavily so on the katapleurotergite. Pleura yellow, more or less pruinose, more heavily so in front; dorsopleural membrane more buffy yellow. Halteres with stem yellow, knob infuscated. Legs with coxæ and trochanters brownish yellow, sparsely pruinose; femora reddish brown, with a relatively narrow black subterminal ring; tibiæ and basitarsi somewhat darker brown, the outer tarsal segments passing into black; claws simple. Wings with a strong fulvous brown tinge, only slightly patterned with darker brown and more yellowish areas; the darker brown includes the stigma and a small spot at origin of *Rs*, paler brown washes in outer portions of cells *R*<sub>2</sub> and *R*<sub>3</sub>, on outer half of *M* and on basal portion of *Cu*, the two latter areas subtended by clearer yellow markings: cell 1st *A* vaguely streaked with pale brown and yellow; veins beyond cord and 2nd *A* very narrowly but evidently seamed with brown; veins brown. Venation: *Rs* about twice *m-cu*; petiole of cell *M*<sub>1</sub> usually subequal to *m*.

Abdominal tergites yellow, narrowly trivittate with dark brown, the stripes interrupted by pale caudal borders of the segments; lateral tergal borders narrowly pale; sternites chiefly yellow, on outer segments the dark colour more extensive, forming a subterminal ring; hypopygium yellow. Ovipositor with cerci long and straight. Male hypopygium with the ninth tergite (fig. 2, 9t) extensive, the lateral lobes broad, obliquely truncated; a deep double median notch from the base of which arises a slender median tooth or lobe, its apex broadly obtuse; tergal setæ abundant but pale and inconspicuous. Inner dististyle with setæ of outer margin abundant but relatively small and weak, especially those of basal half. Lobe of eighth sternite (fig. 2, 8s) long but broadly flattened, widest on about the basal two-thirds, thence narrowed to the obtuse tip, covered with numerous strong reddish setæ; greatest width of lobe more than one-third the length.

*Hab.* Peru (Ayacucho).

*Holotype*, ♂, Yanamonte, La Mar, in fog forests, altitude 3000–4100 metres, August 26, 1941 (Woytkowski). *Allotopotype*, ♀, pinned with type. *Paratopotypes*, 7 ♂♀, July 20–September 10, 1941.

Readily told by the large size, relatively short antennæ of male, coloration of thorax and wings, and especially the structure of the male hypopygium, notably the ninth tergite. The character of a median lobe or tooth on the ninth tergite is very uncommon in the *monilifera* group, being found in the otherwise very different *Tipula stenoglossa* Alexander and *T. woytkowskiana* Alexander, both from Peru.

*Tipula stenoglossa propitia*, subsp. n.

Similar to typical *stenoglossa* Alexander (Peru : Huanuco), differing especially in the larger size, different wing-pattern, and slight differences in the male hypopygium.

*Male*.—Length about 17–18 mm.; wing 19–20 mm.; antenna about 10.5–11 mm.

Pale wing-pattern much more distinct than in the typical form, especially the post-stigmal area which extends from costa across the subbasal portions of the outer radial cells, crossing cell 1st  $M_2$  into extreme bases of cells  $M_3$  and  $M_4$ ; the zigzag white area at near two-thirds the length of cell  $M$  conspicuous; a more or less distinct whitening in distal end of cell  $R_5$ . General structure of hypopygium as in the typical form, including the ninth tergite and lobe of the eighth sternite. Ninth tergite with lateral lobes narrower and more prominent; median lobe more slender, more or less notched at apex. Outer dististyle longer and more slender, more distinctly clavate, with shorter apical setæ.

*Hab.* Peru (Ayacucho).

*Holotype*, ♂, Yanamonte, La Mar, in fog forests, altitude 3000–4100 metres, September 2, 1941 (Woytkowski). *Paratopotype*, ♂, September 3, 1941.

*Tipula callithrix*, sp. n.

Belongs to the *monilifera* group; general coloration of notum brown, the prescutum with four brown stripes and an additional capillary median vitta; interspaces more yellow pollinose, with conspicuous dark setigerous punctures; antennæ (male) elongate, the outer portion of each flagellar segment weakly dilated; halteres yellow; femora pale brown, the tips black, preceded by a narrow, obscure yellow ring; wings whitish subhyaline, heavily patterned with brown; a

complete white crossband beyond cord ; outer cells of wing with numerous macrotrichia ; basal abdominal segments yellow, narrowly darkened on sides, the outer segments more darkened ; median lobe of eighth sternite small, about twice as long as wide at base, with conspicuous setæ.

*Male*.—Length about 13 mm. ; wing 15.5 mm. ; antenna about 11 mm.

*Female*.—Length about 16–17 mm. ; wing 16–18 mm.

Frontal prolongation of head yellowish brown to brown above, darker on sides, no nasus ; palpi black. Antennæ (male) elongate, approximately two-thirds the length of wing ; scape and pedicel yellow ; basal flagellar segment yellow at base, infuscated on distal half, remainder of flagellum black ; flagellar segments with abrupt basal enlargements, as normal for the group, the distal portion of stem further dilated into a longer but lower swelling ; verticils elongate, all basal in position except one on outer face at near mid-length. In female, antennæ short, the proximal six or seven segments clear light yellow, the outer ones infuscated ; segments simple, gradually decreasing in size outwardly, with conspicuous verticils. Head buffy, with a more or less defined median brown dash that becomes obsolete before the occiput ; sides of vertex behind eyes similarly infuscated.

Pronotum obscure brownish yellow, darker laterally. Mesonotal præscutum with the ground golden yellow, with four brown stripes and an additional capillary median vitta, the cephalic third or less of sclerite paling to brownish grey ; intermediate stripes confluent into a solid mass on posterior half of sclerite ; interspaces with sparse but conspicuous setigerous punctures ; scutum chiefly dark brown, the median area paler ; scutellum greyish yellow, parascutella brownish black ; postnotum dark brown, with conspicuous erect setæ. Pleura with the ventral sclerites obscure yellow, the dorsal region with a broad, conspicuous, brownish-black longitudinal stripe extending from the cervical region to beneath the wing-root, the dorsopleural membrane abruptly yellow ; ventral sternopleurite weakly infuscated. Halteres pale yellow. Legs with the coxæ obscure yellow ; trochanters yellow ; femora pale brown, the tips black, preceded by a narrower obscure yellow ring ; tibiæ and tarsi black ; claws (male) with weak basal points but scarcely toothed. Wings with the ground-colour whitish subhyaline, heavily and handsomely patterned with brown clouds, involving all the cells and forming a contrasting picture ; largest dark areas

at near mid-length of wing in cells *R* and *M* ; extensive but less conspicuous areas in cells beyond cord and on basal third of wing ; cell *C* yellow, except for narrow brown areas at base and apex ; cell *Sc* with four conspicuous brown areas, the interspaces yellow ; stigma oval, dark brown, confluent with the darkened mass at and before cord ; the white ground includes a narrow but complete crossband beyond cord, very extensive areas on basal third of wing, and smaller, slightly more yellowish ones, in outer cells of wing ; prearcular field variegated white and brown ; veins brown, more yellowish brown in the brightened costal portions. Conspicuous and abundant macrotrichia in all apical cells from *R*<sub>3</sub> to *M*<sub>4</sub>, inclusive. Venation : tip of *R*<sub>1+2</sub> very pale to atrophied ; petiole of cell *M*<sub>1</sub> subequal to or longer than *m* ; cell 1st *M*<sub>2</sub> short to moderate in length.

Abdominal tergites yellow, with distinct brown pattern on sides of segments two to four, this colour becoming obsolete behind ; terminal segments darker ; sternites yellow ; hypopygium brownish yellow. Male hypopygium (fig. 3) with the tergite, 9t, transverse, its caudal margin variously lobed, including two very low obtuse submedian lobes and more conspicuous subcarinate sublateral and lateral ones. Outer dististyle elongate, a little enlarged on distal portion. Inner dististyle with a high dorsal crest on outer third only, opposite the subapical beak ; setæ of style long and abundant but not forming an even row as in some species. Gonapophyses, *g*, with the inner lobes having their margins conspicuously spinulose. Eighth sternite, 8s, with a small lobe, about twice as long as wide at base, provided with conspicuous setæ.

*Hab.* Peru (Ayacucho).

*Holotype*, ♂, Yanomonte, La Mar, in fog forests, altitude 3000-4100 metres, September 2, 1941. *Allotopotype*, ♀, September 8, 1941. *Paratopotypes*, 3 ♀♀, September 7-October 2, 1941.

This species and the next to be described are readily told from all other members of the *monilifera* group by the lack of a nasus and presence of macrotrichia in outer cells of wing. They are readily told between themselves by characters given under the second species.

*Tipula callisto*, sp. n.

Belongs to the *monilifera* group ; allied to *callithrix* ; mesonotum with cephalic half of præscutum, scutellum and postnotum, together with the pronotum, golden yellow pollinose,

the posterior half of præscutum and the scutum abruptly dark brown; nasus lacking; antennæ (male) about one-half the length of wing; flagellar segments with the abrupt basal enlargement as in the group, with an additional outer swelling, somewhat as in *callithrix* halteres yellow; femora chiefly blackened, with a narrow yellow subterminal ring; wings whitish subhyaline, conspicuously patterned with dark and paler brown; a complete white crossband beyond cord; sparse macrotrichia in outer ends of cells  $R_3$  to  $M_1$ , inclusive; abdomen yellow, the sublateral portions of tergites infuscated; outer four segments of male abdomen blackened; male hypopygium with the tergite transverse, with two low submedian teeth; gonapophyses with a single undivided lateral plate, the margins toothed.

*Male*.—Length about 13–14 mm.; wing 14–16 mm.; antenna about 7.5–8 mm.

*Female*.—Length about 15–18 mm.; wing 15–18 mm.

Frontal prolongation of head relatively long, subequal to the remainder of head, yellow above, infuscated on sides beneath; nasus lacking; palpi black. Antennæ (male) relatively long, about one-half the length of wing; scape and pedicel yellow; first flagellar segment brownish yellow, narrowly infuscated at apex; remainder of antennæ black; flagellar segments shorter than in *callithrix*, more deeply incised, the distal enlargement of the segments being much better developed, causing the segments to appear more notched than in *callithrix*; a powerful isolated seta on outer face of segment at near mid-length. In female, the proximal four or five segments yellow, the succeeding one or two weakly bicoloured, with darker bases, the outer segments uniform brownish black; antennæ short, the segments simple; first flagellar segment more than twice the length of the second and much stouter. Head reddish brown, yellow pollinose, heaviest on orbits and mid-line.

Pronotum reddish yellow, yellow pollinose. Mesonotal præscutum with cephalic half reddish yellow, conspicuously yellow pollinose except at sides, the posterior half and the scutum abruptly dark brown to produce a dimidiate appearance; on the præscutum, indications of a pale brownish-grey median stripe on the yellow anterior portion; scutellum and postnotum reddish yellow, conspicuously golden yellow pollinose. Pleura similarly heavy yellow pollinose over a reddish ground; indications of a weak reddish-brown longitudinal



stripe from the cervical region to beneath the wing-root. Halteres uniformly yellow. Legs with coxæ yellow, yellowish grey pollinose; trochanters yellow; femora restrictedly obscure yellow basally, passing into black, with a narrow but conspicuous yellow subterminal ring, this narrower than the blackened tips on all legs; tibiae and tarsi black; claws (male) with a very weak denticle at near proximal third. Wings with the ground colour whitish subhyaline, with a dark and pale brown pattern arranged much as in *callithrix*, including a complete white band beyond cord; dark colour of basal third of wing usually more extensive. Macrotrichia of outer cells of wing much more restricted, especially in female, occasionally lacking; in most cases occurring in extreme outer ends of cells  $R_3$  to  $M_1$ , inclusive, with occasional scattered trichia in cell 2nd  $M_2$  in some specimens. Venation: Tip of  $R_{1+2}$  pale to atrophied, in cases including most of the vein; petiole of cell  $M_1$  shorter than  $m$ .

Abdominal tergites yellow, patterned sublaterally with brown, this becoming more extensive on outer segments, reaching the lateral border at proximal end of segment; segments six to nine, inclusive, of male black; basal tergite more pruinose. Male hypopygium (fig. 4) with the tergite, 9t, transverse, the caudal border shallowly emarginate on either side of two submedian blunt teeth. Basistyle with lobe short, blackened. Ninth sternite with lobe elongate, densely setuliferous. Gonapophyses,  $g$ , broadly flattened, with a single undivided triangular plate that is toothed on margin. Eighth sternite, 8s, with the median lobe short, about twice as long as wide, provided with long coarse setæ.

*Hab.* Peru (Ayacucho).

*Holotype*, ♂, Yanamonte, La Mar, in fog forests, altitude 3000–4100 metres, September 25, 1941 (*Wotykowski*). *Allotopotype*, ♀, September 21, 1941. *Paratopotypes*, 2 ♂♂, several ♀♀, September 3–October 5, 1941.

The only close ally of the present fly is *Tipula callithrix*, sp. n., which differs conspicuously in the coloration of the thorax, the structure of the male antennæ and in the hypopygium. The macrotrichia in the outer cells of wing are invariably much fewer and more restricted in area in the present fly. The two species are quite isolated from other members of the group in the distal dilation of the flagellar segments of the male, lack of a nasus, and presence of macrotrichia in outer cells of wing.

*Limonia (Neolimnobia) excelsior*, sp. n.

General coloration of mesonotum brownish black, the præscutum with more brownish-yellow stripes on cephalic two-thirds; rostrum black; basal flagellar segments bicoloured, yellow at base, the apex of each broadly dark brown; femora yellow, with three clearly delimited brownish-black rings; wings very pale yellow, with an unusually abundant reticulated brown pattern that leaves no clear crossbands on any portion; *Rs* relatively long, subequal in length to cell 1st *M*<sub>2</sub>; abdominal tergites dark brown, the basal segment more greenish yellow.

*Female*.—Length about 8 mm. . wing 9.5 mm.

Rostrum and palpi black. Antennæ with scape light yellow, pedicel and basal four or five segments of flagellum bicoloured, narrowly yellow at base, dark brown at apex, the amount of yellow decreasing on outer segments, distal segments uniformly blackened; basal flagellar segments with very short pale apical necks; segments long-oval, the terminal one equal in size to the penultimate. Head greyish brown, the centre of the vertex somewhat more infuscated; anterior vertex (female) relatively narrow, about one-half wider than the diameter of scape.

Pronotum obscure yellow medially, somewhat darker on sides. Mesonotal præscutum with brownish-yellow stripes on the cephalic two-thirds of sclerite, the interspaces and posterior third brownish black; humeral region obscure yellow, behind which is a brownish-black area, following which, again, is a yellowish pollinose mark; central region of scutum and base of scutellum yellowish grey pruinose, the remainder blackened; mediotergite blackened, the pleurotergite more brownish black, the suture between the two paler. Pleura chiefly brownish black, the propleura and dorsopleural membrane more greenish yellow. Halteres with stem greenish white, the knob deeper green. Legs with the fore coxæ dark brown, the other coxæ yellow; trochanters yellow; femora yellow, with three clearly delimited brownish-black rings, the most basal one narrowest, placed before mid-length of segment; outer dark rings subequal to the intervening yellow annulus and slightly more extensive than the yellow tip; tibiæ obscure yellow with a very narrow but conspicuous dark brown ring just beyond base; proximal segments of tarsi obscure yellow, the outer ones black. Wings with the ground-colour very pale yellow, the prearcular and costal fields somewhat more

saturated yellow; an unusually heavy and abundant reticulated brown pattern involving all the cells, with larger areas at near one-third the length of cell *R*, mid-length of cell *M* and over the anterior cord; no pale crossbands anywhere on disk, the spaces being occupied by these abundant transverse markings; as an example of abundance of these, cell *M* has about ten such narrow areas in addition to the central mass; margin of cell 1st *A* with four or five such areas; veins brown, paler in the interspaces. Venation: *Sc*<sub>1</sub> ending just before origin of *Rs*, *Sc*<sub>1</sub> alone about four-fifths as long as *Rs*, the latter relatively long, about equal to cell 1st *M*<sub>2</sub>; supernumerary cross-vein in cell *R*<sub>3</sub> at near two-thirds the length of cell; cell 1st *M*<sub>2</sub> subequal in length to distal section of *M*<sub>1+2</sub>; *m-cu* at fork of *M*; cell 2nd *A* not conspicuously widened opposite the anal angle.

Abdominal tergites dark brown, the basal segment more greenish yellow, the outer lateral angles of the outer tergites slightly paler; sternites chiefly yellow, especially the outer segments, the bases and lateral portions more infuscated; genital shield brown. Ovipositor with cerci long and slender, gently upcurved, horn-coloured.

*Hab.* Peru (Huanuco).

*Holotype*, ♂, Piedras Grandes, altitude 3000 metres, November 29, 1937 (*Woytkowski*).

*Limonia* (*Neolimnobia*) *excelsior* is very different from the other known members of the subgenus. In the nature of the leg-pattern it is closest to species such as *L. (N.) tricineta* (Alexander), likewise from Peru, but in the very abundantly reticulated wing-pattern it more suggests species such as *L. (N.) anthracopoda* Alexander, of south-eastern Brazil.

*Limonia* (*Peripheroptera*) *dis*, sp. n.

General coloration black, the surface sparsely yellow pollinose or grey pruinose, the latter heaviest on the pleura; knobs of halteres blackened; legs black, only the femoral bases restrictedly yellow; wings pale yellow, the broad prearcular field clear light yellow; a broad, conspicuous brown seam over the cord; outer end of cell 1st *M*<sub>2</sub> very slightly darkened; wing-apex slightly darker than the central portion of disk; free tip of *Sc*<sub>2</sub> more than its own length before the level of *R*<sub>2</sub>; inner ends of cells *R*<sub>3</sub>, *R*<sub>4</sub> and 1st *M*<sub>2</sub> in transverse alignment; abdominal tergites dark, with a brown median stripe.

*Male*.—Length about 7 mm. ; wing 10 mm.

Rostrum and palpi black. Antennæ black throughout ; first flagellar segment short-oval, with short basal pedicel ; succeeding segments passing through oval to elongate-oval ; terminal segment exceeding the penultimate. Head black, the surface subopaque by a very sparse yellow pollen.

Pronotum black, sparsely pruinose. Mesonotal præscutum almost covered by three subnitidous black stripes, the restricted interspaces and sublateral portions sparsely yellow pollinose ; lateral præscutal borders again blackened ; posterior sclerites of notum black, the central region of scutum and base of scutellum heavily yellow pollinose, the remainder of scutellum and postnotum less heavily so. Pleura black, conspicuously grey pruinose, especially on the posterior half ; dorsopleural membrane darkened. Halteres with stem yellow, knob abruptly blackened. Legs with all coxæ and trochanters black, very sparsely pruinose ; remainder of legs black, the femoral bases restrictedly yellow, involving about the proximal sixth ; claws (male) with a single small basal tooth. Wings with the ground-colour pale yellow, the broad prearcular field abruptly clear light yellow ; stigmal area very diffuse and ill-defined, the cephalic portion more yellowed than that lying behind the radial vein ; free tip of  $Sc_2$  and  $R_2$  very narrowly seamed with still darker brown ; a broad conspicuous brown seam along cord, from the proximal end of stigma to vein  $Cu$  ; seam over outer end of cell 1st  $M_2$  very narrow and inconspicuous ; wing-apex from level of outer end of cell 1st  $M_2$  faintly darkened, the colour extending back to vein  $Cu$  ; a restricted postarcular darkening in bases of cells  $R$  and  $M$  ; basal half of cell 2nd  $A$  darkened ; veins brown, more brightened in the ground-interspaces, those in the prearcular field clear bright yellow. Venation : Free tip of  $Sc_2$  more than its own length before level of  $R_2$ , both transverse ;  $R_{1+2}$  jutting beyond level of  $R_2$  as a short spur ;  $Rs$  gently arcuated, about one-third longer than the basal section of  $R_{4+5}$  ; inner ends of cells  $R_3$ ,  $R_5$  and 1st  $M_3$  in transverse alignment ; cell 1st  $M_2$  elongate, subequal to vein  $M_{1+2}$  beyond it ;  $m-cu$  about one-third its own length beyond fork of  $M$ , straight ; cell  $M_4$  relatively deep, the distal section of  $Cu_1$  fully twice  $m-cu$  ; cell 2nd  $A$  relatively narrow, constricted on proximal third.

Abdominal tergites dark greyish brown, darker brown medially to form a nearly continuous stripe ; the more basal

tergites slightly brightened laterally ; sternites, together with the hypopygium, blackened.

*Hab.* Peru (Ayacucho).

*Holotype*, ♂, Yanamonte, La Mar, in fog forests, altitude 3000–4100 metres, September 2, 1941 (*Woytkowski*).

The specific name is derived from the coloration. Dis is the Roman equivalent of the Greek Pluto. The most similar species is *Limonia* (*Peripheroptera*) *rediviva* Alexander, from moderate altitudes in the Peruvian Andes. In this species, the halteres and legs are entirely black, while the entire thorax, including the pleura, is virtually without pruinosity. The black colour in *rediviva* shows reddish tints through the black to produce a decided piceous appearance on both the notum and pleura, a condition not emphasized in the original definition.

*Limonia* (*Geranomyia*) *tulumayensis*, sp. n.

General coloration reddish brown ; thorax unpatterned ; rostrum exceeding one-half the length of body, halteres infuscated ; legs light brown, unpatterned, wings with a weak brown tinge, unpatterned except for the darker brown oval stigma ;  $Sc_1$  ending about opposite two-fifths the length of  $R_2$  ; male hypopygium with the tergite narrowly transverse ; ventral dististyle very large and fleshy, its rostral prolongation short and obtuse, with two subequal spines arising close together from small basal tubercles ; gonapophyses with outer edge of lobe toothed and erose.

*Male*.—Length, excluding rostrum, about 5 mm. ; wing 5.5 mm. ; rostrum about 3 mm.

Rostrum relatively long, dark brown, yellow at base. Antennæ with scape and pedicel obscure yellow, the latter darkened apically ; flagellum black ; basal flagellar segments short and crowded, the outer ones passing into oval ; terminal segment subequal in length to the penultimate. Front obscure yellow, posterior portion of head grey ; anterior vertex reduced to a narrow line.

Thorax almost uniform reddish brown, without evident præscutal stripes or other markings, the posterior sclerites of notum sparsely pruinose. Halteres relatively short, infuscated. Legs with the coxæ reddish yellow ; trochanters yellow ; remainder of legs light brown, unpatterned. Wings with a weak brown tinge, unpatterned except for the darker brown oval stigma ; veins brown, those in the costal and pre-

arcular fields a trifle more brightened. Venation ; *Sc* relatively long, *Sc*<sub>1</sub> ending about opposite two-fifths the length of *Rs*, *Sc*<sub>2</sub> near its tip ; supernumerary cross-vein in cell *Sc* at near mid-length of distance between arculus and origin of *Rs* ; cell 1st *M*<sub>2</sub> longer than vein *M*<sub>2</sub> beyond it ; *m-cu* close to fork of *M*, about one-fifth longer than the distal section of *Cu*<sub>1</sub> ; cell 2nd *A* relatively narrow, the vein beyond the level of arculus nearly straight.

Abdomen reddish brown, the hypopygium concolorous. Male hypopygium (fig. 5) with the tergite, 9t, narrow, transverse, the caudal border gently emarginate, the lobes very low, with conspicuous setæ. Basistyle, *b*, and its ventromesal lobe small, the total area scarcely one-third that of the ventral dististyle, the lobe with very long pale setæ. Dorsal dististyle a gently curved sickle, at apex suddenly narrowed into a point. Ventral dististyle, *vd*, large and fleshy, the rostral prolongation correspondingly small, obtuse at apex ; spines two, from very short basal tubercles ; spines subequal in length, placed relatively close together. Gonapophyses, *g*, with the mesal-apical lobe toothed or erose along the outer edge.

*Hab.* Peru (Junin).

*Holotype*, ♂, Tulumayo Valley, Tarma, altitude 4000-8000 feet, October 25, 1940 (*Woytkowski*).

The present fly is readily told from other approximately similar species of the subgenus by the coloration of the body, legs and wings, in conjunction with the hypopygium. Among such species it is somewhat like *Limonia*(*Geranomyia*) *nugatoria* Alexander, but differs in the coloration and venation of the wings, body-pattern, and structure of the male hypopygium.

*Trentepohlia* (*Paramongoma*) *calliope*, sp. n.

General coloration of mesonotum brownish grey, the præscutal stripes confluent or virtually so, leaving the lateral borders broadly obscure brownish yellow ; pleura almost uniform testaceous yellow ; antennal flagellum black, the scape and pedicel brown ; knobs of halteres dark brown ; fore coxæ darkened ; femora with a broad black subterminal ring, the tips abruptly white ; tibiæ with about the central two-thirds black, the base and broader apex white ; basitarsi white, the extreme tip infuscated ; wings subhyaline, the stigma subcircular, dark brown ; weak brown washes, especially evident in basal radial field and at wing-tip ; vein *R*<sub>2</sub> unusually erect, *R*<sub>1</sub> arising from its base ; abdominal tergites

dark brown, the lateral border yellow: sternites obscure yellow.

*Female*.—Length about 8 mm.; wing 7 mm.

Rostrum yellow; outer palpal segments infuscated. Antennæ with scape and pedicel brown, the tips more yellowish, flagellum black; flagellar segments long-oval, subequal in length to the segments. Head brownish grey, the posterior portions of vertex and occiput paling to yellow; anterior vertex very narrow, reduced to a narrow strip that is scarcely as wide as two rows of ommatidia.

Mesonotal præscutum brownish grey, the usual three stripes virtually united into a discal shield, leaving broad obscure brownish-yellow lateral borders; posterior sclerites of notum dark brown, the median region of scutum paler, the scutellum and postnotum grey pruinose. Pleura and pleurotergite almost uniform testaceous yellow, sparsely pruinose. Halteres with stem yellow, knob dark brown. Legs with the coxæ testaceous yellow, the fore pair more infuscated; trochanters obscure yellow; femora obscure yellow basally, deepening to black just before the broad white tip, the latter approximately one-half as extensive as the blackened ring; tibia with the base broadly white, in degree a little exceeding the femoral tips, followed by a very broad black ring that involves about two-thirds the total length of segment, the tip again broadly white; basitarsi snowy white, the extreme tip infuscated; legs broken beyond this point. Wings subhyaline, the subcircular stigma dark brown, conspicuous; weak brown washes, especially basad of cord and most evident in the radial field, particularly the outer portion of cell *R* and adjoining portions of cord; wing-tip narrowly and vaguely darkened; veins brown, more brownish yellow in the costal field. Venation: vein *R*<sub>3</sub> unusually erect, *R*<sub>2</sub> arising from its base, there being no element *R*<sub>3+4</sub>; cell 1st *M*<sub>2</sub> subequal in length to vein *M*<sub>1+2</sub> beyond it; *m-cu* about one-fourth its length before the fork of *M*.

Abdominal tergites dark brown, the lateral borders yellow; sternites obscure yellow. Ovipositor with cerci infuscated, except at tips, relatively long and very slender, gently up-curved to the acute tips.

*Hab.* Peru (Junin).

*Holotype*, ♀, Satipo, Jauja, altitude 800–900 metres, July 16, 1940 (*Paprzycki*).

Most similar to *Trentepohlia* (*Paramongoma*) *petulans* Alexander, of south-eastern Brazil, differing in the details of

coloration of the body, legs and wings, and in the venation, as the unusually erect vein  $R_3$ .

*Neognophomyia paprzyckiana*, sp. n.

General coloration of thorax brownish yellow, conspicuously patterned with brownish black; antennæ brown; femora chiefly dark brown, their bases restrictedly brightened; wings subhyaline, unpatterned; vein  $R_3$  much longer than usual in the genus, approximately three-fifths as long as vein  $R_4$ , cell  $R_2$  at margin being nearly as extensive as cell  $R_3$ ; male hypopygium with the tergal spines relatively short and stout, the tips very acute; dististyle on inner portion produced into a long slender spine that is scarcely roughened.

*Male*.—Length about 4.5 mm.; wing 4.8 mm.

*Female*.—Length about 5 mm.; wing 5 mm.

Rostrum testaceous brown; palpi darker. Antennæ relatively long; scape and pedicel dark brown, flagellum a little paler; flagellar segments oval, with conspicuous verticils. Head light brown.

Thorax crushed and discoloured, brownish yellow, patterned with darker brown or brownish black, especially on præscutum, scutal lobes and postnotum. Pleura obscure yellow, conspicuously patterned with black, especially on dorsal sclerites and again on sternopleura. Halteres chiefly pale brownish yellow. Legs with the coxæ yellow, the fore and middle pairs a trifle darker; trochanters obscure brownish yellow; femora chiefly dark brown, their bases rather restrictedly brightened; tibiæ and basitarsi obscure yellow, the tips narrowly infuscated; terminal tarsal segments brownish black. Wings subhyaline, unpatterned, the prearcular and costal regions a little more yellowed; veins brown, paler in the brightened areas. Venation: Sc, relatively short, subequal to  $R_{2+3+4}$ , the latter, in turn, a trifle longer than  $R_{3+4}$ ;  $R_3$  much longer than usual in the genus, approximately three-fifths as long as vein  $R_4$ , cell  $R_2$  at margin being nearly as extensive as cell  $R_3$ ; cell 1st  $M_2$  only moderately broad, narrowed at base;  $m-cu$  more than its length beyond fork of  $M$ ; cell 2nd  $A$  relatively narrow. In one wing of type, an adventitious cross-vein in cell  $R_4$ .

Abdomen with the tergites chiefly darkened, paler in their central portions; sternites chiefly yellow, more darkened medially; hypopygium dark brown. Male hypopygium (fig. 6) with the so-called tergal spines,  $rs$ , relatively short



and stout, near their tips strongly narrowed, each terminating in a very acute blackened point. Basistyle, *b*, with unusually long powerful setæ. Dististyle, *d*, distinctive, the outer arm or style flattened, its outer margin with four strong setæ, of which one is terminal in position, another immediately back from tip; inner lobe or style heavily blackened, bearing several setæ, two of large size; at base of style a long blackened scabrous spine, this subequal in length to the style, at its base with four strong setæ. Phallosome, *p*, relatively broad, depressed-flattened, the apex subtruncate to very slightly emarginate, blackened.

*Hab.* Peru (Junin).

*Holotype*, ♂, Satipo, Jauja, altitude 800–900 metres, September 15, 1940 (*Paprzycki*). *Allotopotype*, ♀, May 31, 1940 (*Paprzycki*).

I am very pleased to name this fly in honour of the collector, who has discovered many new Tipulidæ in the vicinity of Satipo. A short but very interesting description of Satipo and vicinity has been published by Paprzycki (Rev. Chilena Hist. Nat. xlv. 390–392, 3 figs., 1940). This is the most isolated species of the genus so far discovered, differing from all others of the now numerous species in the unusual length of vein  $R_3$  and the corresponding widening of cell  $R_2$ , and in the structure of the male hypopygium, especially the scabrous blackened spine of the dististyle.

*Neognophomyia bisetosa*, sp. n.

General coloration yellow, the dorsal thoracic pleura with an interrupted brownish-black stripe; antennal flagellum black; legs yellow, the terminal tarsal segments darkened; wings whitish subhyaline, restrictedly patterned with pale brown; vein  $R_2$  short,  $R_4$  unusually long, so cell  $R_2$  at margin is fully ten times as extensive as is cell  $R_3$ ; abdominal tergites yellow medially, broadly blackened on sides; male hypopygium with the tergal spines terminating in very delicate twisted points; outer dististyle with only two setæ, one terminal; inner style narrowed to a slender blackened point; phallosome unusually broad, the narrowed apex blackened.

*Male*.—Length about 5.5 mm.; wing 5.5 mm.

Rostrum brownish yellow; palpi darker brown. Antennæ with scape and pedicel pale brown, the latter darker outwardly; flagellum black; segments oval. Head obscure yellow; eyes (male) relatively large, narrowing the anterior vertex.

Thoracic notum yellow, polished, the scutellum paler. Pleura yellow, with an interrupted brownish-black dorsal stripe that appears as individual marks on propleura, anepisternum and adjoining portions of the dorsopleural membrane, dorsal pteropleurite and adjoining portions of pleurotergite. Halteres with stem yellow, knob broken. Legs with coxæ and trochanters light yellow, remainder of legs yellow, the terminal tarsal segments more infuscated. Wings whitish subhyaline, the prearcular and costal fields slightly more yellowish; stigma and a narrow seam over the anterior cord pale brown; veins brown, more brownish yellow in the brightened fields. Venation. vein  $R_3$  short, vein  $R_4$  unusually long, deflected strongly caudad, ending at wing apex; cell  $R_2$  at margin very narrow, scarcely one-tenth that of cell  $R_3$ ; cell 1st  $M_2$  moderately widened outwardly.

Abdominal tergites on central portions, broadly brownish black on sides, subterminal segments more uniformly yellow; hypopygium darkened. Male hypopygium (fig. 7) with the so-called tergal spines, *ts*, slender, curved, pale, gradually narrowed to very delicate twisted points. Outer dististyle or branch, *od*, with only two setæ, one apical. Inner dististyle relatively slender, narrowed to a slender-acute blackened point; surface of style with about seven very strong black setæ from large punctures, in addition to smaller inconspicuous bristles. Phallosome, *p*, unusually broad, the apex narrowed, blackened.

*Hab.* Peru (Junin).

*Holotype*, ♂, Satipo, Jauja, altitude 800–900 metres, July 17, 1940 (*Paprzycki*).

The nearest relatives of the present fly are species such as *Neognophomyia hostica* Alexander and *N. interrupta* Alexander, which differ conspicuously in the structure of the male hypopygium, notably the tergal rods and both dististyles.

*Rhabdomastix* (*Rhabdomastix*) *luteola*, sp. n.

Size small (wing, female, under 5.5 mm.); general coloration of body light yellow, without pattern; antennal flagellum black; halteres and legs yellow; wings greyish yellow, the stigma and a narrow seam over cord pale brown; sparse macrotrichia on distal ends of veins  $R_5$ ,  $M_{1+2}$  and  $M_3$ ; vein *Sc* relatively long, *Sc*, ending about opposite three-fourths vein *Rs*.

*Female*.—Length about 5.5 mm.; wing 5.2 mm.

Rostrum and palpi yellow. Antennæ with scape and pedicel yellow, flagellum black; first flagellar segment stout, nearly twice the second: remaining segments subcylindrical, gradually decreasing in size outwardly. Head testaceous yellow; anterior vertex broad, approximately five times the diameter of the scape.

Thorax uniform light yellow, without pattern, the postnotum and metapleura vaguely whitish pruinose. Halteres pale yellow. Legs yellow, only the terminal segment a trifle darker. Wings greyish yellow, the prearcular and costal fields clearer yellow; stigma light brown, large, but its margins ill-defined; a very narrow and indistinct seam along the cord and vein *Cu*, best indicated by a darkening in colour of the veins. veins pale brown, paler in the brightened portions. Macrotrichia of veins represented by sparse series on distal ends of veins *R*<sub>5</sub>, *M*<sub>1+2</sub> and *M*<sub>3</sub>. Venation: *Sc* relatively long, *Sc*<sub>1</sub> ending about opposite three-fourths to four-fifths *Rs*; *R*<sub>2+3+4</sub> long, subequal to *R*<sub>4</sub>; vein *R*<sub>3</sub> oblique, the distance on costa between *R*<sub>1+2</sub> and *R*<sub>3</sub> about one-third to one-half greater than the latter vein; basal section of *M*<sub>3</sub> much reduced, *m* correspondingly long; vein 2nd *A* strongly sinuous, the cell comparatively narrow.

Abdomen testaceous yellow, including the genital shield. Ovipositor with the valves elongate.

*Hab.* Peru (Junin).

*Holotype*, ♀, Satipo, Jauja, altitude 800–900 metres, March 1, 1941 (*Paprzycki*).

*Rhabdomastix* (*Rhabdomastix*) *luteola* is well distinguished from other regional species by the light yellow coloration of the body, halteres and legs. All other such species have the coloration dark brown or grey.

*Rhabdomastix* (*Rhabdomastix*) *satipœnsis*, sp. n.

Size very small (wing, female, 4 mm.); general coloration light grey, the præscutum with four very faintly indicated darker grey stripes; halteres pale; legs pale yellowish brown, the tarsi paling to yellow; wings pale grey, without markings; prearcular and costal fields clearer yellow; macrotrichia of veins beyond cord very sparse; vein *Sc* short, *Sc*<sub>1</sub> ending opposite mid-length of *Rs* or shortly beyond; cell *R*<sub>3</sub> small, vein *R*<sub>3</sub> suberect; abdomen dark brown, the genital shield concolorous; cerci very long and slender.

*Female*.—Length about 4.5 mm.; wing 4.4–4.2 mm

Rostrum testaceous brown ; palpi brownish black. Antennæ pale brown : flagellar segments (female) oval. Head light grey.

Pretergites pale yellow. Mesonotum almost uniform light grey, the præscutum with four very faintly indicated darker grey stripes : pseudo-sutural foveæ and tuberculate pits dark. Pleura brownish testaceous, sparsely pruinose. Halteres pale. Legs with the coxæ and trochanters yellowish testaceous ; remainder of legs pale yellowish brown, the tarsi paling to yellow. Wings pale grey, the prearcular and costal fields clearer yellow : no stigmal or other markings : veins pale brown, still paler in the brightened fields. Macrotrichia of veins beyond cord very reduced in number, there being only one or two near the outer ends of each of distal sections of  $R_5$  and  $M_{1+2}$ . Venation :  $Sc$  short,  $Sc_1$  ending opposite one-half to three-fifths the length of the long  $Rs$  ; cell  $R_3$  small, vein  $R_3$  suberect,  $R_4$  strongly arcuated ;  $m-cu$  variable in position, from about one-third its length beyond fork of  $M$  to fully its own length.

Abdomen, including the genital shield, dark brown ; ovipositor with the cerci very long and slender, darkened basally, the tips broadly yellow.

*Hab.* Peru (Junin).

*Holotype*, ♀, Satipo, Jauja, altitude 800–900 metres, July 7, 1940 (*Paprzycki*). *Paratopotypes*, 5 ♀♀, August 5–September 6, 1940 ; January 10, 1941 (*Paprzycki*).

The most similar species is *Rhabdomastix* (*Rhabdomastix*) *tantilla* Alexander, of Colombia, which is of about the same size, differing in details of coloration of the body and wings and in the venation, as the longer  $Sc$ , which terminates beyond two-thirds the length of  $Rs$ .

*Rhabdomastix* (*Rhabdomastix*) *alticola*, sp. n.

General coloration of mesonotum almost uniform dark brown to brownish black, without grey colour : antennæ black throughout ; halteres infuscated, the base of stem yellow ; femora infuscated, the tips paling to obscure yellow ; wings with a brownish tinge, the large stigma, prearcular field and proximal portions of cells  $C$  and  $Sc$  more infuscated ;  $Rs$  long and relatively straight, subequal in length to distal section of vein  $R_5$  ; vein  $R_3$  short and nearly erect ; abdomen dark brown.

*Female*.—Length about 7–8 mm. ; wing 7.5–9 mm.

Rostrum very reduced, pale ; palpi black. Antennæ black throughout, relatively short (female) ; flagellar segments gradually decreasing in size outwardly ; first flagellar segment stout, nearly as long as the succeeding two segments taken together ; terminal segment longer than the penultimate. Head dull black, sparsely pruinose ; anterior vertex broad.

Pronotum dark brown, the posterior lateral portions obscure yellow ; pretergites dark. Mesonotum almost uniform dark brown to brownish black, without grey colour, the præscutum paling to brown on the humeral and lateral portions ; scutellum a trifle more testaceous brown. Pleura in the paratype specimens brown, in the type more bicoloured, obscure yellow with the dorsal sclerites strongly infuscated ; sternites and ventral meral region darkened. Halteres infuscated, the base of stem yellow. Legs with the coxæ pale brown ; trochanters obscure yellow ; femora infuscated, their bases restrictedly paler, the tips fading to obscure yellow ; tibiæ and tarsi brown. Wings broader than in *peruviana*, with a brownish tinge, the large stigma, prearcular field and proximal portions of cells *C* and *Sc* more infuscated ; veins brown. Macrotrichia of veins beyond cord occurring on distal portions of  $R_5$ ,  $M_{1+2}$ ,  $M_3$  and, in cases, the extreme outer portion of  $M_4$ , the trichia long and conspicuous. Venation :  $R_s$  long and relatively straight, subequal in length to the distal section of vein  $R_5$  ; vein  $R_3$  short and nearly erect, the distance on margin between veins  $R_{1+2}$  and  $R_3$  approximately three times the latter ; vein  $R_4$  relatively long, gently arcuated, subequal to  $R_{2+3+4}$ .

Abdomen dark brown : ovipositor with genital shield brownish yellow ; cerci long and slender, blackened basally, the outer portion horn-yellow.

*Hab.* Peru (Ayacucho).

*Holotype*, ♀, Yanamonte, La Mar, in fog forests, altitude 3000–4100 metres, September 3, 1941 (*Woytkowski*). *Paratopotypes*, 3 ♀♀, September 1–7, 1941.

The most similar described species is *Rhabdomastix* (*Rhabdomastix*) *peruviana* Alexander, from the vicinity of Lima, Peru. Of this I have seen only the male sex. This differs from the present fly in the brownish-yellow antennæ, pale halteres, the yellow femora with slightly darker tips, and the paler wings, with distinct venational details, as the oblique vein  $R_2$ .

XXXIII.—*New Oriental Staphylinidæ (Col.)*. By MALCOLM CAMERON, M.B., R.N., F.R.E.S.

(OXYTELINÆ.

*Trogophlæus (Tænosoma) lucidus*, sp. n.

Shining; head darker, thorax lighter reddish brown, elytra reddish yellow narrowly infusate at the base; abdomen light reddish brown. Antennæ reddish, the first five segments and legs reddish yellow. Length 2 mm.

In colour and general facies much resembling *calanus* Bernh. but smaller, the antennæ thinner, the sculpture different. Head short, transverse, very nearly as broad as the thorax, the curve of the eye as long as that of the rounded post-ocular region: bi-impressed in front, smooth along the middle, elsewhere with small scattered punctures. Ground sculpture extremely weak, practically absent. Antennæ with the 4th and 5th segments about as long as broad, 6th a little narrower than the 5th and 7th, transverse, 8th more transverse, 9th and 10th yet more transverse, with the 11th forming a club. Thorax formed as in *calanus*, transverse (3.3 : 2.5), the sides evenly rounded, more retracted towards the base, the dorsal impressions very feeble, scarcely indicated, the punctures larger and closer than on the head; ground sculpture scarcely visible. Elytra longer (3.5 : 2.5) and broader than the thorax, transverse (4 : 3.5), the punctures about as close but rather smaller and more superficial, the ground sculpture very indistinct. Abdomen coriaceous, practically impunctate, very sparingly pubescent.

Zanzibar. In seaweed. Unique. My collection.

*Trogophlæus (Troginus) variegatus*, sp. n.

Fore-parts moderately, abdomen more shining. Head and abdomen black; thorax reddish brown, elytra bright reddish yellow, slightly infusate at the scutellum. Antennæ reddish yellow, the last five segments infusate. Legs reddish yellow. Length 1.5 mm.

In build and antennal structure scarcely differing from *exiguus* E., but at once distinguished by the bright coloration, moreover the puncturation of the head and thorax is finer than in that species and so less distinct from the ground-sculpture; elytra and abdomen as in *exiguus*. The elytra are a little longer than the thorax, as long as broad.

**Mauritius** : Port Louis. On the bank of a stream. Type in my collection.

*PÆDERINÆ.*

*Medon* (s. str.) *oculatus*, sp. n.

Fore-parts black, moderately shining, abdomen pitchy black, the posterior margins of the 7th and 8th tergites brownish yellow. Antennæ reddish brown. Legs brownish yellow, the femora and tibiæ infusate. Length 5 mm.

Head transverse (3.5 : 2.75) subquadrate, slightly broader than the thorax, the eyes large and prominent, fully twice as long as the temples, the briefly-rounded posterior angle with a minute tooth, broadly bi-impressed between the eyes and between the antennal tubercles, the anterior impressions very finely, superficially and sparingly punctured, the posterior less finely and more closely punctured, rugulose as at the sides and base, the middle of the disc almost impunctate : ground-sculpture coriaceous. Antennæ moderate, the 3rd segment longer than the 2nd, 4th to 7th longer than broad and decreasing in length, 8th to 10th as long as broad. Thorax transverse (3.2 : 2.5), trapezoidal, before the middle of the base with a small fovea, the whole surface closely covered with small granules and without ground-sculpture. Elytra longer (4 : 2.5) and broader than the thorax, as long as broad, somewhat uneven, finely closely and asperately punctured. Abdomen extremely finely, moderately closely punctured and finely pubescent, the sides and apex with black setæ. Fore-parts sparingly pubescent but with black setæ at the sides.

♂ : Unknown.

Madagascar: Analamazotre, xi-i. 1930 31. (*M. G. Olson* jeff.) Unique. In my collection.

*Medon* (*Hypomedon*) *marinus*, sp. n.

Fore-parts shining ferruginous red, the elytra extensively infusate but leaving the base and suture clear; abdomen pitchy brown, the greater part of the 7th tergite reddish, the 8th reddish yellow. Antennæ, palpi and legs reddish yellow. Length 3.5 mm.

Except for the shorter elytra much resembling *cinnamopterus* Kr. in build, but smaller, much more shining and with different sculpture.

♂ : head transverse (2 : 1.75), subquadrate, a little broader than the thorax, the eyes small, a good deal

shorter than the temples, the posterior angles briefly rounded ; the front and a rather broad parallel median area extending from the base to the front without sculpture, on each side of it between the eyes with a small fovea, the rest of the surface closely covered with small umbilicate punctures, rather larger than in *cinnamopterus*. Antennæ moderate, slender, 3rd segment longer than the 2nd, 4th to 6th longer than broad, decreasing in length, 7th about as long as broad, 8th to 10th slightly transverse. Thorax trapezoidal, as long as broad, along the middle with narrow shining keel, on each side of it near the base with a feeble impression, the puncturation much finer and more superficial than on the head, scarcely umbilicate. Elytra slightly longer than the thorax, as long as broad, the puncturation close, much coarser than on the thorax and with a fine yellow pubescence. Abdomen very finely and rather closely punctured and yellow pubescent.

♂ : 6th sternite with acute triangular excision.

Mauritius : Port Louis. In seaweed. Unique. In my collection.

#### CHETOCEPHALUS, gen. nov.

Build of *Cephalochetus* Kr. and closely allied to it, but the head without basal fovea and median sulcus, the thorax without raised lines and with coarse umbilicate sculpture like the head. The mandibles, as in *Cephalochetus*, each with a strong bicuspid tooth, the cusps pointed, the labrum in the middle of the anterior border with triangular emargination at its apex with a minute tooth, on each side of the notch with two crenulations. The maxillary and labial palpi are formed as in *Cephalochetus*, but the former is furnished with a very small and narrow conical 4th segment. The tongue is short and broad with triangular emargination in the middle reaching the base but is strongly chitinized. The structure of the rest of the insect scarcely differs from that of *Cephalochetus*. The reflexed sides of the elytra are without keel. Type *maritimus*, sp. n.

#### *Chetocephalus maritimus*, sp. n.

Pitch black, rather dull, the antennal tubercles and anterior border of the head shining yellowish red, the raised margins of the tergites brownish yellow. Antennæ and legs reddish yellow. Length 5.5 mm.



Head longer than broad (3.5 : 3), broader than the thorax, wider behind, the eyes situated behind the middle and as long as the rounded and slightly dilated temporal region, in front of the eyes parallel-sided and deeply sulcate for the 1st segment of the antenna; front triangularly impressed, shining, very finely longitudinally wrinkled and with a few punctures behind, the rest of the surface closely covered with rather large reticulate-umbilicate sculpture, along the middle with a fine smooth shining line. Antennæ with the 3rd segment twice as long as 2nd, 4th to 6th a little longer than broad, decreasing in length, 7th to 10th short obconical. Thorax longer than broad (3 : 2.5), widest at the rounded anterior angles, the sides behind straight and retracted to the rounded posterior angles, along the middle with rather broad raised shining area with a few minute punctures, elsewhere with similar sculpture to that of the head. Elytra longer (4 : 3) and broader than the thorax, longer than broad, the puncturation moderately fine, close and transversely rugulose. Abdomen rather finely and rather closely punctured, finely pubescent, the fore-parts more sparingly.

♂ : 6th sternite with deep triangular excision in the posterior margin, its edges bevelled. The anterior tarsi not dilated.

Mauritius : Port Louis. In seaweed. Type in my collection.

### STAPHYLININÆ.

#### PARADIATRECHUS, gen. nov.

Very near *Diatrechus* Bernh., in build similar but at once distinguished from it by the broad short and flattened tarsi, longer strongly bidentate mandibles, and longer palpi. From *Scelotrichus* Bernh. differs in the narrow acute mesosternal process etc. Labrum bilobed. Mandibles prominent, long and pointed, each with two large triangular pointed teeth. Maxillary palpi with short 1st segment, 2nd long, curved and a little thickened towards the apex, the 3rd scarcely half as long, the 4th fully twice as long as the 3rd. Tongue very small, membranous, with small triangular notch in the apical border. Labial palpi rather long, the 1st segment half as long as 2nd, 3rd much longer than the 2nd, gradually thickened towards the pointed apex. Pronotal epipleura narrow, the superior curved line deflexed and meeting the inferior in front of the middle. Mesosternal process acute, narrow, extending

about half the length of the coxæ, these contiguous behind. Tibiæ with a few spines. Anterior tarsi strongly dilated (at least in the ♂), middle and posterior short, flattened, the 1st segment stout, a little longer than the last, 2nd to 4th gradually shorter, cordate.

*Paradiatrechus niger*, sp. n.

Shining, black, the posterior margins of the tergites narrowly and obscurely reddish. Antennæ with the first six segments black (the 2nd and 3rd reddish at the base), the rest wanting. Legs pitchy brown, the tarsi lighter. Length 13 mm.

Head longer than broad (8.5 : 7.5), oval-oblong, as broad as the thorax, the eye small, only about a third as long as the post-ocular region; at the inner border of the eye in front with an umbilicate puncture: puncturation moderately fine and moderately close. Antennæ with the 3rd segment a little longer than the 2nd, 4th to 6th longer than broad, decreasing in length, the 6th about twice as long as broad, the rest wanting. Thorax longer than broad (9.5 : 7.5), the sides rounded in front, in the posterior half strongly sinuately retracted, the puncturation rather finer than on the head and rather less close. Elytra longer (11 : 9.5) and broader than the thorax, rather finely, moderately closely punctured. Abdomen throughout less finely and less closely punctured than the elytra. Fore-parts without ground-sculpture, that of the abdomen extremely fine, scarcely visible.

♂: Anterior tarsi strongly dilated. First four sternites at the middle of the posterior margin with a small rounded projection: 5th at the base with a large round deep impression, its fundus on each side with a curved ridge furnished with long close black hairs, the surface behind the impression flattened and glabrous, the posterior border feebly arcuately emarginate: 6th with broad deep arcuate emargination.

S.E. Madagascar: Midongy. Unique. My collection.

*TACHYPORINÆ.*

*Tachyporus somaliensis*, sp. n.

Shining; fore-parts reddish yellow, abdomen reddish brown, the posterior margins of the tergites broadly rufescent. Antennæ and legs reddish yellow. Length 2.75 mm.

In build much like *chrysomelinus* L., but smaller and differently coloured, the antennæ shorter, constructed as in *atricaps* Steph. Head and thorax with a few minute scarcely visible

punctures, the sides of the latter each with four moderate setæ. Elytra as broad as but longer than the thorax (3·5 : 2·2), as long as broad, finely and uniformly punctured as in *chrysomelinus* but without ground-sculpture, the sides each with four moderate black setæ. Abdomen as finely but less closely punctured than in *chrysomelinus*, the ground-sculpture extremely fine, scarcely visible.

♀: 8th tergite on each side with broad triangular pointed process; in the middle with a plate separated by a narrow deep excision from the lateral process and divided at apex by a narrow excision for half its length into two narrow processes, which extend slightly beyond the level of the lateral.

Somaliland : Dolphin Bay. Type in my collection.

#### *ALEOCHARINÆ.*

##### *Pronomæa insularis*, sp. n.

Fore-parts moderately shining, the head black, the thorax and elytra dark reddish brown, abdomen shining black, the posterior margins of the first four visible tergites rufescent, the 5th and 6th reddish yellow. Antennæ reddish, the first three segments and legs reddish yellow. Length 2·3 mm.

A small narrow species with well-marked median keel on the anterior tergites. Head closely covered with small umbilicate punctures: ground-sculpture rather feeble. Antennæ with the penultimate segments fully twice as broad as long. Thorax transverse (3·50 : 2·75), the sides gently rounded in front, straight and a little retracted behind, rather broadly superficially impressed posteriorly in the middle, on each side a little before the base with a small fovea, the puncturation finer, closer and more superficial than on the head. Elytra very slightly longer than the thorax (3 : 2·75), transverse, finely and rather closely punctured. Abdomen with distinct median keel at the base of the first three visible tergites, the impressions closely and rather coarsely punctured, elsewhere with smaller and more sparing punctures, especially on the last two segments. Pubescence on the fore parts fine and close, much more sparing on the abdomen.

Zanzibar. Unique. My collection.

##### *Gyrophæna* (s. str.) *carinata*, sp. n.

Shining, reddish brown, the elytra more or less infusate posteriorly, the 3rd and 4th visible tergites darker. Thorax

with dorsal row of 4 or 5 small punctures, of which the pre-basal is the largest. Antennæ and legs yellow. Length 2 mm.

In size and build much like *affinis* Sahlb. Head broad, a little narrower than the thorax, eyes large, temples short; with a few very small scattered punctures. Antennæ moderate, 4th segment small, transverse, 5th to 9th slightly, 10th scarcely transverse. Thorax transverse (3.5 : 2), the sides gently rounded in front, straight and retracted behind, on each side with an irregular row of 4 or 5 small punctures, externally with 1 or 2 others. Elytra longer (3 : 2) and broader than the thorax, transverse (4.75 : 3), with a few minute scattered punctures. Abdomen with a few minute punctures. The whole insect without ground-sculpture.

♂ : Elytra with a strong keel near the postero-external angle parallel to the lateral margin; 7th tergite with a pair of keels slightly converging backwards; 8th with three teeth, the centre one broader than the lateral with rounded apex, the lateral smaller, sharply pointed, all of equal length.

Madagascar : Annanarivo (Sikora). Type in my collection.

*Cameronium flavipenne*, sp. n.

Shining black, the elytra yellowish red, infusate around the scutellum, the last tergite yellowish. Antennæ and legs reddish yellow. Length 1.2 mm.

Smaller than *obockianum* Fauv. more shining and differently coloured, the 3rd segment of the antennæ much shorter, the ground-sculpture weaker. Head subquadrate, as broad as the thorax, the posterior angles briefly rounded, the eye small, shorter than the temple; disc with small feeble impression, rather closely covered with small superficial punctures as in *obockianum* but more distinct, the ground-sculpture finer than in that species. Antennæ with the 1st and 2nd segments of equal length, 3rd much shorter than 2nd, about half as long, 4th to 10th gradually more transverse, the penultimate fully twice as broad as long, 11th as long as the 9th and 10th together. Thorax very slightly transverse (2 : 1.75), the sides rounded in front, sinuately retracted behind, the posterior angles rounded, obsoletely and narrowly impressed along the middle, very sparingly and very obsoletely punctured, the ground-sculpture distinct, coriaceous. Elytra slightly longer (2 : 1.75) and broader than the thorax, transverse (2.5 : 2), finely, closely but superficially punctured,

the ground-sculpture feeble. Abdomen slightly narrowed before apex, very finely, sparingly punctured, rather more sparingly than in *obockianum*, the ground-sculpture fine, coriaceous. Pubescence fine, moderately close on the foreparts, more scanty on the abdomen.

Zanzibar. In seaweed. Unique. My collection.

*Tachyusa* (s. str.) *madecassa*, sp. n.

Shining, black. Antennæ with the first four segments reddish yellow, the following infusate. Legs reddish yellow, the middle and posterior femora infusate at apex. Length 2.75 mm.

Very near *nigerrima* Cam., but distinguished at once by the colour of the antennæ and legs and also in the following respects: the head is shorter, more transverse, the eyes larger, as long as the post-ocular region, the punctures not quite so fine; the antennæ scarcely differ in structure; the thorax as in *nigerrima*, as long as broad and as broad as the head, but the sides behind more strongly sinuately retracted, the puncturation extremely fine, scarcely differing, the elytra as finely but less closely punctured: first two visible tergites much less closely punctured in the impressions and the puncturation elsewhere extremely fine and much more sparing than in *nigerrima*, especially on the 4th and 5th visible tergites; in other respects similar.

Madagascar: Annanarivo (Sikora). Type in my collection.

*Atheta* (s. str.) *madecassa*, sp. n.

Moderately shining, head and abdomen black, the latter with the posterior margins of the first three visible tergites narrowly reddish; thorax reddish brown; elytra brownish yellow. Antennæ with the first three segments reddish yellow, the following dark reddish brown. Legs reddish yellow. Length 3.2 mm.

In size, build and lustre very like *crassicornis* F. and, except for the thorax, similar in colour, but with longer antennæ and finer and less closely punctured head, thorax and abdomen.

♂: Head transverse, narrower than the thorax, flattened on the disc, broadly impunctate along the middle, at the sides very finely and not very closely punctured, finely but distinctly coriaceous. Antennæ with the 3rd segment distinctly longer than the 2nd, distinctly compressed laterally, 4th as long as broad or very slightly transverse, 5th to 10th scarcely

differing, slightly transverse. Thorax transverse (4.5 : 3.5), longer and less transverse than in *crassicornis*, more finely and less closely punctured than in that species, but with similar ground-sculpture. Elytra longer (4.5 : 3.5) and broader than the thorax, transverse (6 : 4.5), scarcely emarginate postero-externally, the sculpture scarcely differing from that of *crassicornis*. Abdomen a little narrowed before the apex, finely and very sparingly punctured, the ground-sculpture very weak. 8th tergite with a small cultriform tooth on each side of the posterior margin, which is feebly quadricrenulate : 6th sternite produced and broadly rounded.

Madagascar : Annanarivo (Sikora). Type in my collection.

*Atheta* (s. str.) *yemenensis*, sp. n.

Moderately shining : head and thorax dark ferruginous red ; elytra brownish yellow, slightly infusate about the scutellum and postero-externally ; abdomen with the first three visible tergites ferruginous red, the 4th and 5th black, the 6th yellowish. Antennæ pitchy black, the first two segments and legs reddish yellow. Length 2 mm.

In size and build much resembling *basicornis* Muls. and Rey, but differs in the colour, longer and more slender antennæ, smaller eyes, weaker ground-sculpture of the head and thorax, the latter with the posterior angles completely rounded, the elytra rather more finely and distinctly less closely punctured, the ground-sculpture weaker, abdomen much more sparingly punctured. Head subquadrate, large, but narrower than the thorax, eyes rather small, extremely finely and very sparingly punctured, the ground-sculpture distinct, coriaceous. Antennæ with the 3rd segment slightly shorter than 2nd, 4th as long as broad, 5th to 10th gradually more transverse, the penultimate about twice as broad as long. Thorax transverse (3.3 : 2.5), the sides gently rounded, a little retracted behind, the posterior angles rounded, the sculpture as on the head. Elytra broader and longer (3 : 2.5) than the thorax, very finely and sparingly punctured, the ground-sculpture similar. Abdomen parallel, very finely and very sparingly punctured, the ground-sculpture very fine, transverse. No special characters visible in the two examples before me.

Aden. Type in my collection.

PSEUDACROTONA, gen. nov.

In build somewhat resembling *Thamiasæa cinnamomea* Gr. but smaller and with more acuminate abdomen, which has

also a distinct squamiform sculpture, and longer and thinner posterior tarsi. Head suborbicular, a good deal narrower than the thorax, in which the base is inserted, with the temples bordered below. Labrum transverse, broadly feebly arcuately emarginate in front, the emargination with fine membranous border. Mandibles stout, straight, the apex slightly incurved and pointed, edentate. Maxillary palpi rather long, the 3rd segment a good deal longer than the 2nd, slightly thickened towards the apex, 4th subulate, half as long as the 3rd. Mentum transverse, trapezoidal, truncate in front. Labial palpi rather long, the 1st segment with a constriction internally behind the apex and four long setæ: 2nd as long but narrower. Tongue long and narrow, longer than in *Thamiaræa*, as long as the 1st segment of the labial palpus and split to the middle into two narrow diverging lobes. Paraglossæ well developed, extending to the apex of the 1st segment of the labial palpus and ciliate internally. Pronotum transverse, the epipleura not visible from the side. Prosternum short, not carinate. Mesosternum simple, its process narrow and acute, extending two-thirds the length of the coxæ (these narrowly separated) and meeting the metasternum, an intersternal piece being absent. Abdomen narrowed from base to apex, the first three visible tergites transverse impressed, the sculpture squamiform. Elytra distinctly emarginate postero-externally. Legs slender; tibiæ finely pubescent. Tarsi 4, 5, 5; the anterior with the first three segments short and equal, the 4th longer than the three preceding together; middle with the first three segments rather short, the 4th a little shorter; posterior with the 1st segment elongate, half as long again as the 2nd, 3rd and 4th gradually shorter.

*Pseulacrotona madegassa*, sp. n.

Moderately shining; head, thorax and first two visible tergites dark reddish brown; elytra smoky brown, the 3rd to 6th visible tergites black, the posterior margins of the 5th and 6th obscurely yellowish. Antennæ and legs yellow. Length 3 mm.

Head transverse, suborbicular, narrower than the thorax (3.5 : 5.5), the eyes large, longer than the temples, but not prominent, very finely, moderately closely punctured and with a fine short pubescence, the ground-sculpture very fine, wavy. Antennæ rather short and slender, the 3rd segment as long as the 2nd, 4th to 6th slightly longer than broad, decreasing in

length, 7th as long as broad, 8th to 10th slightly transverse, 11th as long as the 9th and 10th together. Thorax transverse (5.5 : 4), convex, the sides rounded. more retracted in front than behind, the posterior angles rounded, the sculpture as on the head. Elytra at the base as broad as the thorax, but longer (5 : 4), transverse (6.5 : 5), the puncturation less fine, very finely asperate, the ground-sculpture feeble. Abdomen narrowed from base to apex, moderately closely and very finely punctured on the first three visible tergites, more sparingly on the following, the sculpture squamose and with feeble more or less transverse ground-sculpture, the pubescence scanty.

Madagascar : Annanarivo (Sikora). Type in my collection.

XXXIV.—On some *Polyclad Turbellarians* from the *Cayman Islands*. By STEPHEN PRUDHOE, Department of Zoology, British Museum (Natural History).

THE Polyclads recorded in this paper were collected by Mr. N. Paton, while acting as Zoologist to the Oxford University Cayman Biological Expedition, 1938. The collection includes two new species, one of which is considered to belong to a new genus. The localities mentioned are presumably to be found in the vicinity of Grand Cayman.

The writer would like to take this opportunity of thanking Dr. H. A. Baylis for allowing him to study the material, and for the great help given in obtaining literature.

## ACOTYLEA.

### *Latocestidae*.

#### *Latocestus caribbeanus*, sp. n. (Figs. 1 & 2.)

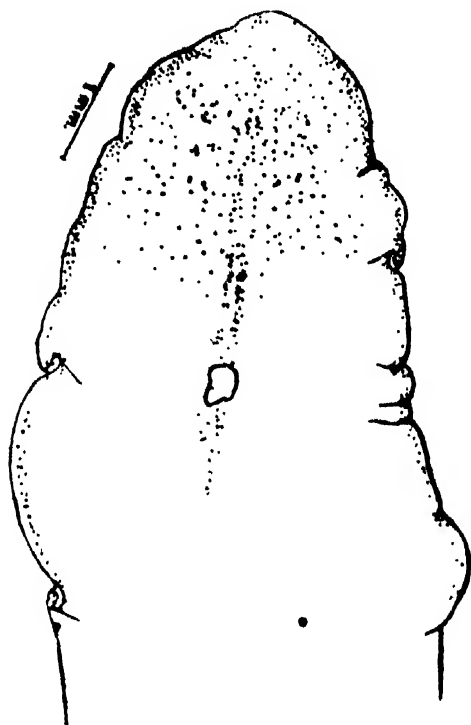
" Ribbon worm from coral split open." " Reef N. from Water Cay."

The worm is elongate, with parallel sides, and rounded at both ends. It is somewhat contracted, measuring about 18 mm. long and 4 mm. wide. The colour of the preserved specimen is uniformly yellowish white. The " brain " lies in the median line at about 3.3 mm. from



the anterior end. The eyes are arranged in two main groups, marginal and cerebral. The marginal eyes extend posteriorly beyond the cerebral eyes to a level shortly behind the "brain." Anteriorly they are arranged in two or three indistinct rows, narrowing posteriorly to a single row. The cerebral eyes, arranged more or less in the median line, spread fanwise anteriorly to merge with

Fig. 1.



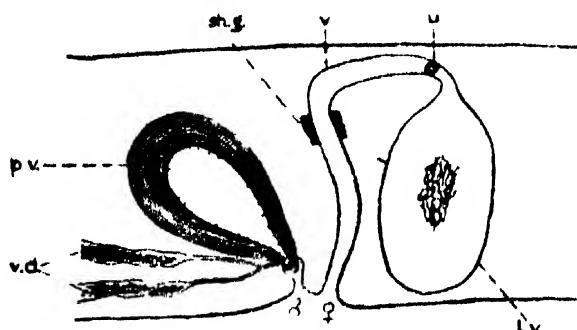
*Lutocestus caribbeanus*. Dorsal view of anterior region,  
showing arrangement of eyes.

the marginal eyes, and reach posteriorly to immediately behind the "brain." There is an oval "ruffled" or "crinkled" pharynx in the posterior region of the body, and opening into it is a long forwardly-directed intestine. The intestine extends almost as far as the "brain," where it divides into two branches, which run anteriorly on either side of the median line. The main intestinal trunk bears numerous lateral branches throughout its length,

and the two anterior branches have several secondary branches directed obliquely forward.

The testes and ovaries lie dorsally to the intestinal branches, as is usual in *Latocestus*. The male genital apparatus is situated immediately behind the pharynx. The vasa deferentia have only a slight muscular covering, and narrow considerably at their posterior ends, where they unite to enter the penis by a short ejaculatory duct. Also entering the penis at this point is a large, pyriform, muscular prostatic vesicle, which lies free in the parenchyme. The lumen of this vesicle does not possess any chambers formed by deep epithelial folds, as in some other members of the genus. The penis is a small muscular papilla-like structure projecting into a shallow antrum masculinum, which leads to the male genital pore.

Fig. 2.



*Latocestus caribbeanus*. Sagittal section through genital organs (diagrammatic). ♂, male genital pore; ♀, female genital pore; L.v., Lang's vesicle; p.v., prostatic vesicle; sh.g., "shell"-glands; u., entrance of uterine canal; v., vagina; v.d., vasa deferentia.

The female genital pore lies immediately behind the male opening, and enters a narrow vagina, which runs dorsally, and then curves posteriorly to enter a globular Lang's vesicle. Shortly before the vagina turns posteriorly numerous elongate "shell-" or "cement"-glands open into it, thus forming a "shell"-chamber. The comparatively large Lang's accessory vesicle is ventrally directed, and contains a mass of spermatozoa. The uterine canals open into either side of the vagina immediately before its junction with the Lang's vesicle.

In the arrangement of the eyes the present species appears to be closely related to *L. marginatus* Meixner,

1907, from the Somali Coast. The former may be distinguished, however, by the absence of a comparatively wide eyeless area between the anterior marginal eyes and the anterior cerebral eyes, and by the absence of deep epithelial folds in the lumen of the prostatic vesicle.

Previously, two species of *Latocestus* had been recorded from the eastern coasts of the Americas, *L. atlanticus* Plehn, 1896, from Rio de Janeiro, and *L. whartoni* (Pearse, 1938), from the U.S.A. *L. atlanticus* may be distinguished from *L. caribbeanus* by the absence of marginal eyes, and by the possession of a pair of muscular accessory seminal vesicles, as well as a chambered prostatic vesicle. In the arrangement and structure of the genital organs the present species is indistinguishable from *L. whartoni*, but the marginal eyes of the latter form a complete series round the body, and until it is shown that the arrangement of the eyes in members of *Latocestus* is so variable as to lose its value as a specific criterion, *L. caribbeanus* should be regarded as a distinct species.

### **Hoploplanidæ.**

#### *Hoploplana grubei* (v. Graff, 1892).

Two mature examples of this species were found with *Gnesioceros sargassicola* on Sargassum weed at the edge of a reef in Water Cay Channel on May 5.

*H. grubei* is a pelagic form, and appears to be widely distributed in the western regions of the North Atlantic Ocean, ranging from Newfoundland to the Caribbean Sea.

### **Planoceridæ.**

#### *Gnesioceros sargassicola* (Mertens, 1832).

A few specimens of this form were collected with *Hoploplana grubei* from Sargassum weed. According to previous records, *G. sargassicola* is very widely distributed in the torrid and temperate zones of the North Atlantic Ocean, ranging between the coasts of Africa and America from about 5° N. to 35° N. Apparently the species has nearly always been found associated with floating Sargassum, and it would seem, therefore, that the weed

has a strong influence on its distribution. So far as the writer is aware, *G. sargassicola* has not yet been recorded as occurring outside the Atlantic region, except in a record by v. Graff (1892) of a single specimen of "*Stylochoplanea sargassicola*," found in a tube containing *Planctoplanea challengeri* from driftwood in Humboldt Bay, New Guinea. Although there is no reason for doubting v. Graff's determination, especially as large areas of floating Sargassum, similar to the Sargasso Sea of the Atlantic, are to be found in the Southern and Pacific Oceans, the claim that *G. sargassicola* is an inhabitant of the Pacific awaits confirmation.

## COTYLEA.

### Boninellidæ.

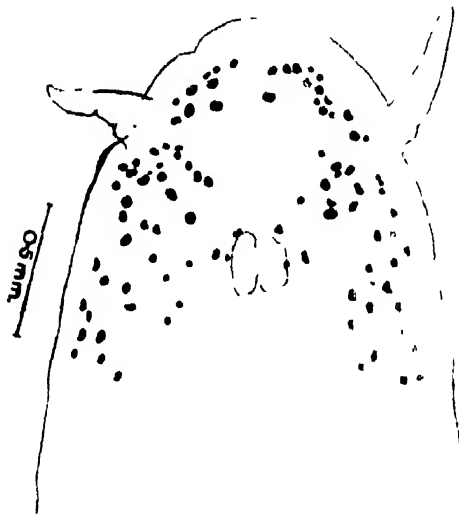
- *Paraboninia caymanensis*, gen. nov., sp. n.  
(Figs. 3-6.).

Of this species three young adult and two immature specimens were collected "from dead *Physalia*" in South Sound on 15 June. The preservation of the material is far from being satisfactory, and consequently certain histological details are lacking in the following description.

The body is elongate, tapering at its posterior end, and flattened dorso-ventrally so as to give the animal a rather delicate appearance. The length of the mature examples is 12.5-13 mm., and the maximum width, which occurs in the middle region, varies between 2.2 mm. and 3.5 mm. The preserved specimens are unpigmented, but when they are treated with a clearing reagent numerous small masses of light brown pigment-granules can be seen scattered in the dorsal epidermis. Owing to the presence of the pigment-granules, it seems possible that the upper side of the living animal is of a light brown or sandy colour, and that the diffused pigment is readily destroyed by an alcoholic preservative. At the body-margin in the anterior region there is a pair of fairly long tentacle-like processes or lateral appendages, which do not bear eyes. The eyes, which are not numerous, are mainly submarginal in position, but a few lie in the cerebral area. The submarginal eyes extend posteriorly to a level just behind the "brain," which is

a bilobed organ lying at about 0.8-0.9 mm. from the anterior end in the mature specimens. The arrangement of the nervous system has not been made out. On the ventral surface of the body there is a  $\Lambda$  shaped sensory furrow, the apex of which is situated in the middle of the anterior body-margin, while the ends are at the lateral margins near the posterior limits of the eyes. Ventrally, in the posterior region of the body, there is a rounded depression, which, although no modification of

Fig. 3

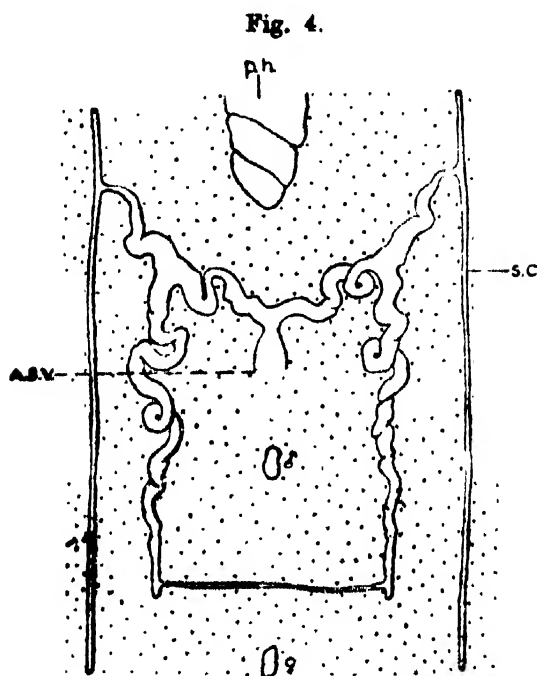


*Paraboninia caymanensis*. Dorsal view of anterior region, showing tentacles and arrangement of eyes.

the musculature has been observed in this region, probably functions as an adhesive organ, representing the true sucker found in most other cotylean polyclads. A short distance in front of the adhesive depression lies a second depression containing the openings of the male organs.

The epidermis consists of ciliated cells, columnar on the dorsal and cubical on the ventral side. Dorsally the cells contain a vast number of stout rhabdites, in addition to the numerous pigment-masses mentioned above, but ventrally the cells contain considerably fewer and more slender rhabdites, and no pigment-masses. The ventral cilia are distinctly longer than those on the dorsal surface. The musculature, so far as could be determined, does not

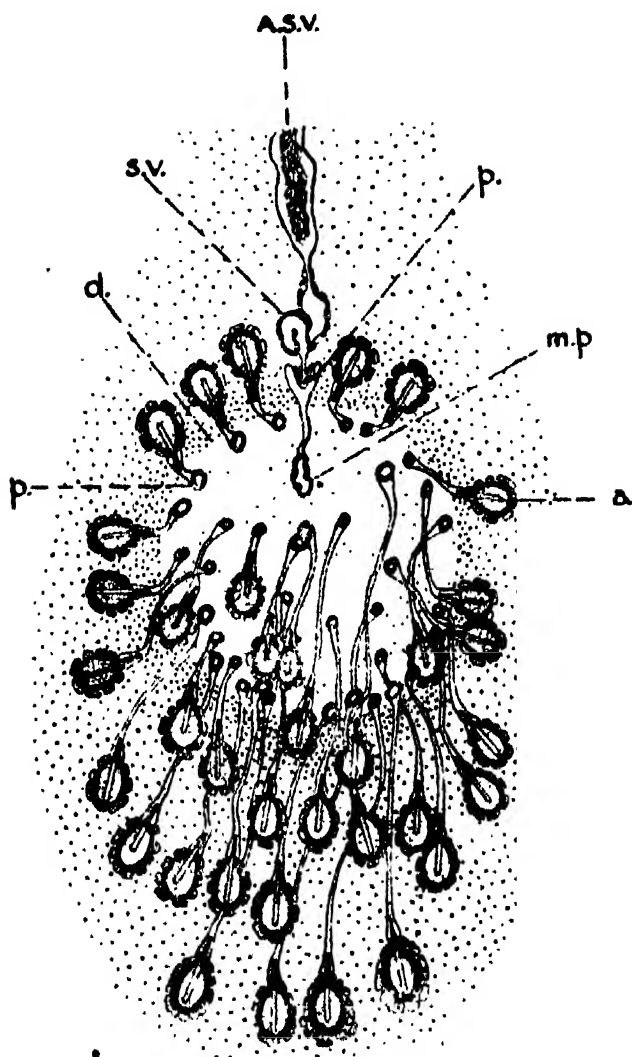
differ from that of most polyclads. Also it is deeper on the ventral than on the dorsal side. The submarginal epidermis of the ventral side appears to be an extension of the dorsal epidermis, and staining with indigo-carminé or Ehrlich's hæmatoxylin contrasts this band with the rest of the ventral epidermis.



*Paraboninia caymanensis*. Representation of vasa deferentia (diagrammatic). ♂, male genital pore; ♀, female genital pore; a.s.v., accessory seminal vesicle; ph., pharynx; s.c., seminal canal.

The mouth, situated behind the middle of the under-surface of the body, leads into a pharyngeal pocket containing an elongated and much twisted muscular pharynx, of the "crinkled" type. The main-gut is median, and extends from a point some distance behind the "brain" to near the posterior end of the body, giving off numerous lateral branches throughout its length. Opening into the anterior end of the main-gut is a long forwardly-directed branch, passing over the "brain" to the end of the body. The presence of a large number of Minot's gland-cells in the main-gut

Fig. 5.



*Paraboninia caymanensis*. Ventral view of male genital apparatus (semi-diagrammatic). a., accessory male organ; a.p., pore of accessory male organ; a.s.v., accessory seminal vesicle; d., ventral depression; m.p., male genital pore; p., penis; s.v., seminal vesicle.

readily distinguishes it from the anterior branch, which contains very few of these cells.

The numerous follicular testes are dorsally and laterally distributed, and extend from a level just behind the "brain" to the posterior end of the body. On each side, the testes are united by slender ducts to a seminal canal running ventrally to them throughout their longitudinal extent. At about the posterior level of the pharyngeal chamber, a convoluted vas deferens opens into the inner side of each seminal canal. The vas deferens widens as it proceeds posteriorly, and soon divides into an outer branch extending as far as a level between the male and female genital organs, and an inner branch extending to the median line. The terminations of the outer branches are united by a transverse commissure. The inner branches unite in the median line, and open into an elongate thin-walled sac, which morphologically appears to be merely a dilatation of an unpaired vas deferens, and is regarded as an accessory seminal vesicle. This vesicle lies longitudinally in the median line, narrowing at its posterior end to enter another elongate vesicle. The latter has a poorly-developed muscular covering, and, as no prostatic glands could be found in close proximity, the structure is considered to represent not a prostatic vesicle but a true seminal vesicle, though it contains no spermatozoa. This seminal vesicle is directed ventrally, and makes a spiral turn before entering a slender ejaculatory duct, which passes through the penis to open into the antrum masculinum. The small, muscular, papilla-like penis projects into the antrum, and is covered by an epithelium continuous with the lining of the antrum-wall. The penis is covered with processes which are thicker and distinctly longer than the cilia in the lumen of the antrum. The antrum masculinum is narrow and relatively long, with its epithelium thrown into four or five longitudinal folds which give the canal a fluted appearance. It opens into a rounded depression about 0.3 mm. wide, situated in the median line at about 1/5 of the body-length from the posterior end. The depression is very shallow, and though readily seen in whole preparations, it is difficult to distinguish in sectioned material.

Surrounding the principal male apparatus in the ventral half of the body there is a large number of

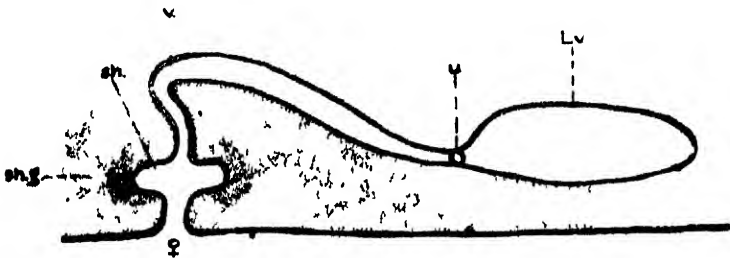


accessory male organs, which appear to be comparable with the accessory prostatic organs described by Bock (1923) in *Boninia*, and with the intromittent prostatic organ described by Laidlaw (1906) in *Traunfelsia*. In the present species, about thirty-three of these organs were counted in one specimen and thirty-eight in another. Each organ is somewhat pyriform, with the narrower end directed towards the antrum masculinum, and consists of a thick muscular envelope containing a fine granular secretion which is readily stained by eosin, and invested with a number of extracapsular glands. The narrower or distal end of the muscular envelope bears a strong chitinous or cuticular stylet, tapering towards its free end. The stylet is hollow, actually forming an extension of a narrow duct passing through the granular secretion, and projects into a slender ciliated canal, which opens externally into the rounded depression, independently of the openings of the other accessory organs. In a sagittal section, the organs are arranged in three layers behind, and two in front of the principal male apparatus. In a dorsal or ventral view, as can be seen in fig. 5, the organs show no special arrangement, except that they are all more or less directed towards the antrum masculinum. There appears, however, to be some indication that the organs lying posteriorly to the antrum may, at a later stage, form three distinct semicircles, and that the organs of the inner semicircle open externally closer to the principal male opening than those of the outer semicircle. Should this supposition be correct, then there appears to be also a possibility that each semicircle bears some relation to one of the three layers seen in sagittal section, especially as in the present material the majority of the organs of the ventral layer seem to open closer to the principal male opening than those of the more dorsal layer.

The ovaries are dorsally arranged in two chain-like series, one on either side, between the testes and the median line, and extend from a short distance behind the "brain" to near the posterior end of the body. Anteriorly the series are close together, but they diverge to pass round the pharynx, and converge again as they proceed posteriorly. The first indication of uterine canals in the present material appears between the median

line and the ovaries at about the anterior level of the male organs. There is one canal on either side, and both run posteriorly to a level behind the female pore. Along this length each canal bears from fifteen to seventeen uterine vesicles, placed dorsally and laterally. The vesicles appear to be filled with a mass of protoplasmic substance containing a number of vacuoles and many nucleated cells. Each vesicle is attached to the uterine canal by a short duct, which is somewhat muscular, suggesting the presence of a sphincter. Posteriorly the uterine canals bend sharply inward and open separately into the vagina, at its junction with the Lang's accessory

Fig. 6



*Parabonnia caymanensis*. Sagittal section through female genital organs (diagrammatic). ♀, female genital pore; L.v., Lang's vesicle; sh., "shell"-chamber; sh.g., "shell"-glands; v., entrance of uterine canal, v., vagina.

vesicle. The latter is a relatively small elongate receptacle, lined with numerous cilia. No spermatozoa were seen in it. From this accessory vesicle the narrow ciliated vagina runs anteriorly for a short distance, and then it turns ventrally to dilate and form a "shell"-chamber, which is surrounded by innumerable "shell"- or "cement"-glands. After forming the "shell"-chamber the vagina continues its course to open externally by the female genital pore. This pore lies on the ventral surface of the body at about  $1/6$  of the body-length from the posterior end.

The new genus is very closely related to *Boninia* Bock, from which it differs mainly in certain characters of the male genital apparatus. The accessory male organs in *Boninia* are arranged in two rings round the principal

male apparatus. Each organ of the upper ring lies immediately above one in the lower, and the pair are enclosed in a thin muscular envelope, so that the arrangement may be interpreted as a single ring of paired organs. Each pair of organs opens separately by a narrow canal into the antrum masculinum. In *Paraboninia* the accessory organs do not appear to be arranged in pairs, each organ being quite independent, and opening separately into a rounded depression on the ventral surface of the body. Furthermore, in the structure of the principal male apparatus of *Boninia*, Bock has recorded the presence of a seminal vesicle and a large prostatic vesicle with weak musculature, while in *Paraboninia* the writer is unable to recognize either of the two vesicles as a functional prostate, and considers them to represent an accessory seminal vesicle and a true seminal vesicle respectively.

It may be argued that, as the present specimens have not yet reached the reproductive stage, they might later have developed prostatic glands opening into the true seminal vesicle, which would then become a prostatic vesicle, thus making the principal male apparatus of *Paraboninia* strictly comparable with that of *Boninia*. But, after carefully examining the specimens, the writer has been unable to find any evidence to support this hypothesis. Moreover, owing to the evidently advanced development of both sets of genital organs, it seems likely that the animals are practically ready to copulate, and a radical change in the structure of any particular organ is very improbable.

It is perhaps worthy of mention that Laidlaw, in stating that the vasa deferentia "open together into the base of the penis," implies that a seminal vesicle and a prostate are absent in the principal male apparatus of *Traunfelsia*—the other known genus of the Boniniidæ. Consequently, the three genera exhibit a series of gradations in the complexity of this apparatus.

With the inclusion of *Traunfelsia* in the Boniniidæ by Bresslau (1933), and the addition of *Paraboninia*, the diagnosis of the family appears to need emendation:—

Body narrow and elongate, with a pair of lateral appendages or tentacles near anterior extremity. An adhesive organ represented by a rounded depression on ventral surface at posterior end of body. Eyes present

### 334 *Polyclad Turbellarians from the Cayman Islands.*

in anterior region, chiefly marginal or submarginal, with the remaining few in cerebral area. Mouth subcentral. Pharynx long, folded, in middle region of body. Main-gut long; gut-branches not anastomosing. Testes and ovaries in dorsal half of body, not intermingling. Principal male apparatus with unarmed penis. A single armed pyriform accessory male organ, or many such organs, present, functioning as prostates. When many, the organs seem to radiate from the principal male apparatus. Uterine canals bearing several rounded vesicles. Vagina with "shell"-chamber. Lang's accessory vesicle present.

#### *Key to Genera.*

1. With a single accessory male organ, . . . *Trautfelsia* Laidlaw, 1906.  
With many accessory male organs, . . . 2.
2. Accessory organs arranged one above the other in pairs, each pair opening into the antrum masculinum by a single duct . . . . . *Boninia* Bock, 1923.  
Accessory organs not arranged in pairs, and opening independently into a shallow depression on ventral surface of body . . . . . *Paraboninia*, gen. nov.

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XXXV. *New Species of African Chrysomelidæ (Coleoptera).*

By G. E. BRYANT, F.R.E.S., Imperial Institute of Entomology.

ALL the types of the new species are in the British Museum (Natural History).

*CRYPTOCERPHALINÆ.*

*Cænobius niger*, sp. n. (Fig. 1.)

Ovate, black shining, with the basal segments of the antennæ and the tarsi fulvous, prothorax finely but not closely punctured, with a row of elongate-shaped punctures along the basal margin, elytra punctate-striate, the interstices longitudinally costate at the sides.

Length 2.5 mm.

♂♀.—Head black, labrum fulvous, the eyes nearly contiguous at the apices, separated by a narrow line. Antennæ short, not extending to the base of the prothorax, the six basal segments fulvous, the remainder black, the two basal segments more dilated. Prothorax black, shining, the apical margin bordered by a deep transverse sulcation, the sides margined, widest at the base, contracted in front, finely but not closely punctured, a row of stronger elongate punctures along the basal margin. Scutellum black, elongate, impunctate. Elytra black, shining, the sides slightly tapering from the base to the apex, finely punctate-striate, the interstices longitudinally costate at the sides. Legs black with the tarsi fulvous. Underside black, the sternum and ventral segments of the abdomen rugosely punctured, the first ventral segment the longest, the female with the apical segment with a rounded fovea.

SIERRA LEONE: Njala, 21. v. 1926 (*E. Hargreaves*), 1 ♂, 1 ♀.

Allied to *C. sjostedti* Weise, but differs in colour and the puncturation, the elytra entirely black.

*Cænobius turneri*, sp. n. (Fig. 2.)

Ovate, convex, flavous, the elytra deep metallic blue, the four apical segments of the antennæ and the claws

fuscous, prothorax nitid, with a row of punctures along the basal margin, the elytra punctate-striate.

Length 2 mm.

♂♀.- Head flavous, coarsely punctured in front, almost impunctate at the base, eyes nearly contiguous at the apices, only separated by a very narrow line. Antennæ short, extending to the base of the prothorax, the four apical segments fuscous, the remainder flavous. Prothorax nitid, a few strong punctures along the basal margin, broadest at its base, the sides contracted in front, an oblique impression on each side behind the middle, the apical margin bordered by a deep transverse sulcation. Scutellum fulvous, narrowly elongate. Elytra deep metallic blue, widest at its base, the sides slightly tapering to the apex, finely punctate-striate. Legs flavous, the claws fuscous. Underside flavous, the first ventral segment very long, all the segments with strong scattered punctures. Female with the apical ventral segment with a deep fovea.

ZULULAND : Gingindhlovu, 29. iv. 1926 (*R. E. Turner*), 5 specimens.

Allied to *C. ruficollis* Baly, from Natal, but differs chiefly in colour, and in the underside being flavous.

*Achænops nigrolineatus*, sp. n. (Fig. 3.)

Flavous, the head black, prothorax with black markings, the elytra with two black longitudinal lines on each, and the suture black, the underside black.

Length 2 mm.

Head black, very finely punctured, clothed with short fine grey pubescence, the labrum flavous, the eyes widely separate. Antennæ extending almost to the middle of the elytra, the first and second segments more dilated, the five basal segments flavous, the remainder fuscous. Prothorax transverse, the sides rounded, widest just behind the middle, contracted to the base, flavous, with a large irregular U-shaped black marking, extending along the basal margin but not extending to the posterior angles, strongly and closely punctured. Scutellum black, nitid. Elytra with the sides almost parallel, slightly broadening towards the apex and thence rounded, flavous, the suture

narrowly black, a longitudinal black line parallel with the suture, not reaching the base or apex, and another not touching the side-margins, strongly punctate-striate, the punctures close together. Legs flavous, the tarsi tinged with fuscous. Underside black, finely and rugosely punctured, clothed with fine short grey pubescence, the first ventral segment of the abdomen as long as the three following.

NATAL : Weenen, x. 1928 (*H. P. Thomasset*), 1 specimen ; Dunbrody, 18. xi. 1902 (*R. J. O'Neil*), 6 specimens. Feeding on *Mimosa*.

Allied to *A. dorsalis* Suff., from S. Africa. *Achænops o'neili* Jac., is simply a variety of *Cryptocephalus thoreyi* Jac., and should be placed in the genus *Cryptocephalus*.

#### EUMOLPINE.

(*Olasposoma acaciæ*, sp. n. (Fig. 4.)

Colour very variable, metallic green to purple, or with the head and prothorax purple and the elytra dark green, prothorax finely punctured, the elytra punctate-striate, the punctures stronger than those on the prothorax.

Length 4 mm.

Head very finely punctured, the labrum black, a short median longitudinal impression on the vertex. Antennæ long and slender, extending to the middle of the elytra, fulvous, the six terminal segments slightly fuscous, and more thickened. Prothorax very transverse, the sides rounded and strongly margined, the surface finely punctured, the punctures slightly stronger than on the head. Scutellum transverse, metallic, impunctate. Elytra with the sides slightly expanded behind the middle and rounded to the apex, strongly punctate-striate, the striae at the sides more confused, transversely impressed near the base, the  $\sigma$  with the shoulders and basal part of the side-margins more rugose. Legs black, the femora with metallic tinge, clothed with short fine pubescence. Underside black, with metallic tinge, the ventral segments of the abdomen rugosely punctured, the first segment the longest.

S. AFRICA : Hendriksdal, xii. 1940 (*F. G. C. Tooke*, S.N. 2369), 11 specimens. Feeding on *Acacia*.

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Allied in structure to *C. femorals* Lef., and *C. flavipes* Har., but very much smaller, and the puncturation quite different.

#### HALTICINÆ.

*Podagrica ornatipennis*, sp. n. (Fig. 5.)

Ovate, brownish yellow, prothorax very finely punctured, the elytra strongly punctate-striate, brownish yellow, with a well-defined black pattern.

Length 4 mm.

Head brownish yellow, impunctate. Antennæ long and slender, extending beyond the base of the elytra, all the segments brownish yellow, the first the longest, twice as long as the second, the third slightly longer than the second, the third to the tenth all about equal, the eleventh longer and acuminate at the apex. Prothorax brownish yellow, very transverse, widest at the base, the sides rounded and contracted in front, very finely punctured, a very deep longitudinal impression at each side on the basal margin, extending half the length of the prothorax. Scutellum triangular, brownish yellow, margined with black, impunctate. Elytra widest behind the middle and thence gradually tapering at the apex, strongly punctate-striate, brownish yellow, with a well-defined black pattern, the base and suture and side-margins narrowly black, a black stria between the fifth and sixth striae, broken in the middle, and a short transverse black patch in front of the middle, not touching the suture. Legs and underside brownish yellow.

KENYA COLONY: Shimba Hills, iii. 1941 (Dr. V. G. L. van Someren), 6 specimens.

This is a very distinct species, no other species having such a well-defined pattern, and the impressions on the prothorax are deeper than is usual in the genus.

*Podagrica fulvida*, sp. n.

Ovate, entirely fuscous, head impunctate, the prothorax very finely and rather closely punctured, the elytra very finely punctate-striate.

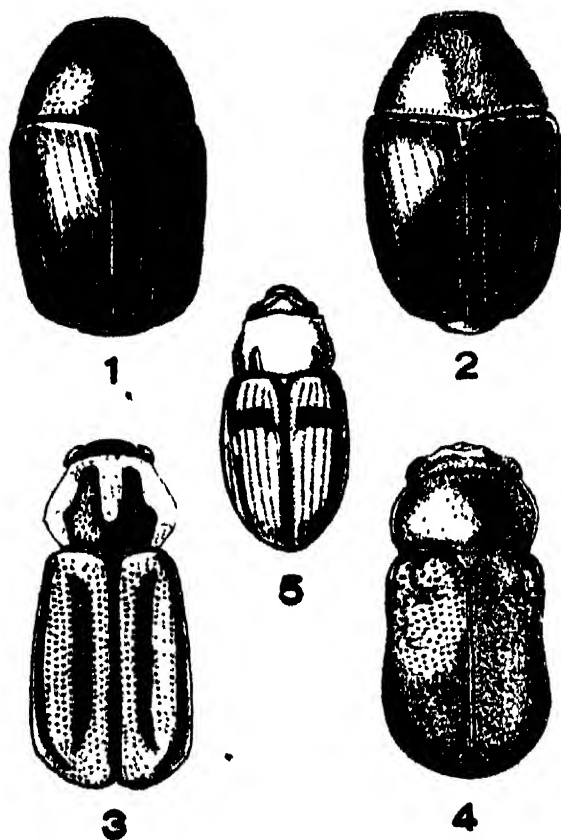
Length 3.5 mm.

Head fulvous, impunctate, transversely impressed between the eyes. Antennæ fulvous, extending well



beyond the base of the elytra, the first segment the longest, the second to the fourth about equal, each shorter than the first, the fifth to the tenth about equal to each other, each slightly longer than the fourth, the eleventh slightly longer and with the apex pointed. Prothorax fulvous, transverse, widest at the base, the

Figs. 1-5.



1. *Canobius niger*, sp. n.  
2. *Canobius turneri*, sp. n.

3. *Achanops nigrolineatus*, sp. n.  
4. *Colasposoma acaciaz*, sp. n.

5. *Podagrira ornatipennis*, sp. n.

sides rounded and contracted in front, very finely and somewhat closely punctured, a longitudinal impression on each side of the basal margin, not extending to quite half the length of the prothorax, the basal margin slightly

expanded in the middle. Scutellum fulvous, triangular, impunctate. Elytra fulvous, slightly wider at the base than the prothorax, rounded at the apex, finely punctate-striate. Legs fulvous, underside fulvous, the first ventral segment as long as the second to the fourth together, a few scattered punctures along the sides of the ventral segments.

KENYA COLONY: Ngong Escarpment, xii. 1937 (Dr. V. G. L. van Someren), 6 specimens.

Somewhat allied to *P. spadicea* Dalm., but much smaller, and distinguished by the elytral striæ single, and the antennæ entirely fulvous, not having the six terminal segments black.

XXXVI.—*Observations on Some British Chrysomonads.*—

I. *Poterioochromonas nutans*, sp. n. By FRANK W. JANE (Dept. of Botany, University College, London).

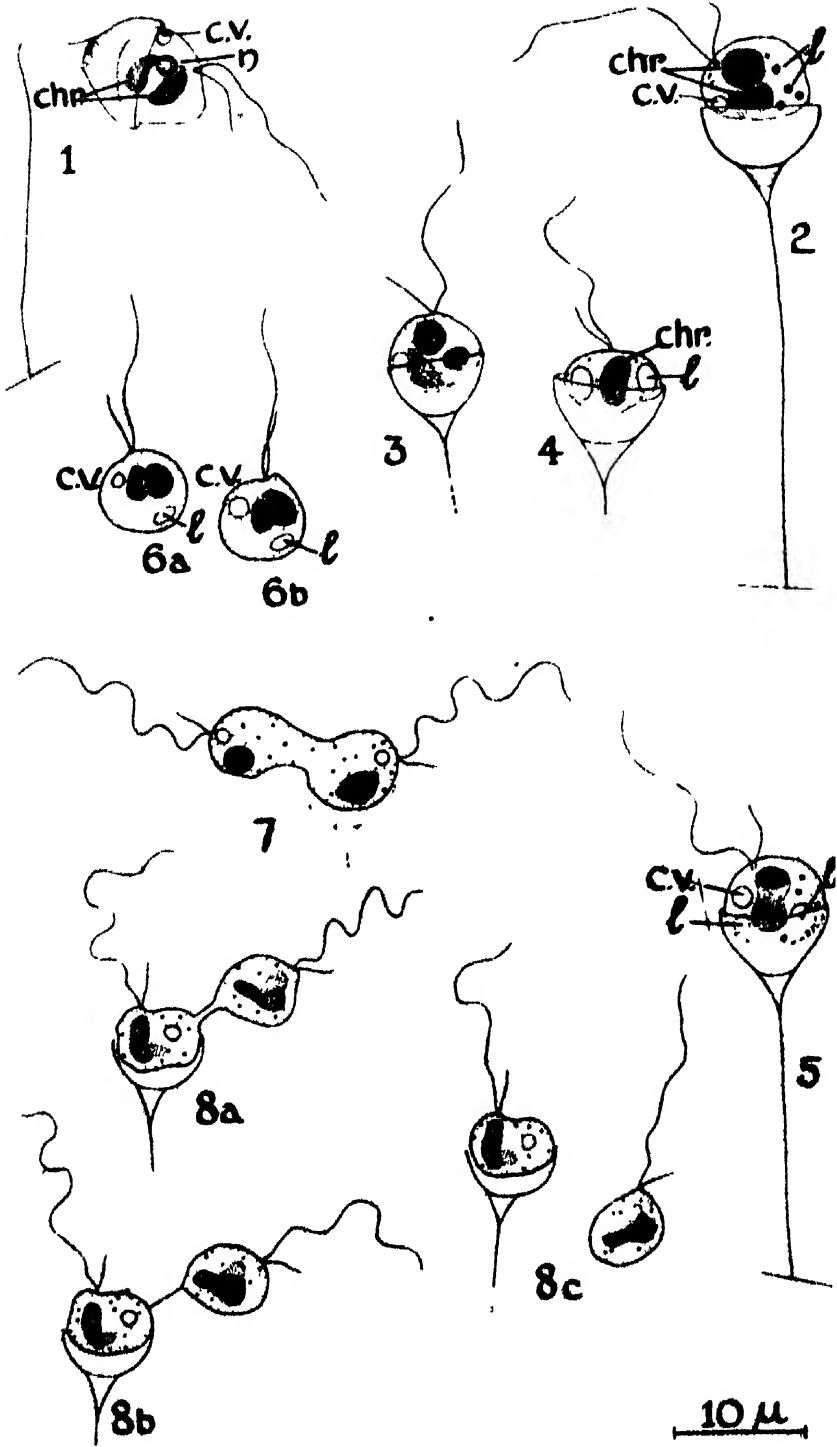
SCHERFFEL (1901) described an *Ochromonas*-like flagellate which inhabited a conical lorica attached to the substratum by a fine stalk of varying length. Essentially, this monad, to which he gave the name *Poterioochromonas stipitata*, differs but little from an epiphytic *Dinobryon* (*Epipyxis*); it has a rounded posterior end, instead of the tail-like posterior extension, by means of which a *Dinobryon* is attached to its lorica; it possesses a single chromatophore instead of the two characteristic of *Dinobryon*, while its lorica is divided into upper and lower halves by a transverse septum, a feature which is not found in *Dinobryon*.

During February, 1944, I observed among algae from a tub in the grounds of the University College of North Wales a small monad, which I passed over casually as a species of *Ochromonas*. Subsequently, among material from the same source, stained with very weak crystal violet, a number of goblet-shaped structures were found, attached to filaments of *Edogonium* by long, very fine stalks: it soon became apparent that these were the lorice of the organism which I had taken for an *Ochromonas*. The monad was sufficiently similar to that

described by Scherffel to justify its inclusion in the genus *Poterioochromonas*, although so different from *P. stipitata* as to be worthy of specific distinction. It may be that this new species is not uncommon; the remarkable transparency of the lorica would make it difficult, if not impossible, to recognize the organism without staining: it is possible, after the real nature of the monad is appreciated, to recognize the cup-shaped part of the lorica in some living specimens, although the full length of the stalk has never been observed except in stained material.

The shallow, cup-shaped part of the lorica is separated from the long stalk by a conical body (figs. 1, 2, 5). Sometimes the wall of the cone is thinner than that of the cup, and its lower part is generally very thin-walled, although the upper region may be as thick-walled as the cup (fig. 2). In one or two specimens the cone was marked by a series of concentric circles (fig. 2), which possibly represent successive zones of growth comparable to those seen in the capsule of *Hyalobryon*; similar rings have not been observed on the cup. The cup has a floor, separating it from the cone; this septum is sometimes very distinct, but it may be very thin. The lorica is stained a clear purple colour by methylene blue, an indication that it contains pectic material.

The monad appears to lie quite free in the upper part of the cup; no structures attaching it to the wall have been observed. The cells vary considerably in shape; they are often more or less spherical (figs. 1, 2, 3), but frequently they have an approximately lenticular shape (fig. 4). Two flagella arise at the anterior end, a long one, which is from two to three times the length of the cell, and which moves in a sinuous manner, and a shorter one, about a third the length of its fellow, and in which the movements are less sinuous. The cell exhibits little metaboly, although slight changes of shape may sometimes be observed at the anterior end, near the flagella; such changes of shape are similar to those which may be seen at the anterior end of a *Dinobryon* and are evidently much less marked than in *P. stipitata*, where Scherffel found that a long, pseudopodium-like structure might be protruded from the anterior end. The protoplasm is very transparent; it contains one or two pale



(For explanation of figures see opposite page.)

olive-green chromatophores (figs. 1 and 4); in one cell three such chromatophores were observed (fig. 3). There is a conspicuous contractile vacuole (figs. 1, 2), which normally occupies a lateral position. The protoplast contains a number of small granules which stain deeply with crystal violet, and in some cells one or two large, transparent colourless bodies may be seen, which are, presumably, leucosin (fig. 4). In only one or two cells has the small nucleus been demonstrated (fig. 1), and in the living organism this structure is invisible.

The cup and cone are normally in line with the stalk, but this is not invariable (figs. 1, 2, 5). Apart from the violent movements of the long flagellum the organism keeps motionless for some time and then, with a sudden rapid jerk, the position of the lorica in relation to the stalk is changed. It is this characteristic jerking movement which has suggested the trivial name—*nutans*—by which I propose to designate the species.

Cell-division is longitudinal, a waist developing across the protoplast (fig. 7); one-half of the dividing cell remains within the cup, the other hangs over the edge; the waist becomes thinner (fig. 8 *a*) until the two daughter cells are attached by a thin protoplasmic bridge, which is no thicker than the flagella (fig. 8 *b*). Throughout division the long flagella are lashing violently, and it is no doubt due to their activity that the thin protoplasmic bridge finally breaks and liberates one daughter cell, which moves off as a free-swimming monad, indistinguishable from an *Ochromonas* (fig. 8 *c*): its sister cell remains

**Figs. 1 and 2**, specimens killed with osmic acid and stained; fig. 2 shows the normal position of the lorica in relation to the stalk. **Fig. 3**, living specimen with three chromatophores (drawn freehand). **Figs. 4 and 5**, specimens with single chromatophore; killed with osmic acid and stained. **Fig. 6**, free-swimming monads; *a* was drawn 8 minutes before *b*; anterior end shows slight metaboly (drawn freehand). **Fig. 7**, early stage of division. **Fig. 8**, later stages of division in a different specimen from that shown in fig. 7; in 8 *b* the sister cells are attached by a very narrow bridge, in 8 *c* the sister cells have separated, one remaining in the lorica the other becoming free swimming.

*chr.*, chromatophore; *c.v.*, contractile vacuole; *l.*, leucosin;  
*n.*, nucleus.

in the parent lorica. The fate of the free-swimming cell has not been followed; no doubt it soon settles down and forms a new lorica. Cell-division is a rapid process; the stage shown in fig. 7 was observed only five minutes before the daughter cells had separated. Resting stages have not been observed.

A comparison of this organism with *P. stipitata* shows that Scherffel's species has more marked animal characteristics. its marked metaboly, which may lead to the formation of a long pseudopodium, is not paralleled by *P. nutans*; further, *P. stipitata* often shows a food vacuole and is evidently able to feed holozoically as well as holophytically; no such food vacuole has been observed in *P. nutans* nor has it been seen to ingest solid particles. In this connection, the variation in the number of chromatophores is of interest: in *P. stipitata* there is normally a single chromatophore, although this may be lacking; in *P. nutans* there are normally one or two chromatophores, although three have been observed.

There is little difference in size between the two species, but the shape of the lorica is so different that there is no likelihood that the two species will be confused.

*Poterioochromonas nutans*, sp. nov.

Cella iacet in lorica calyciformi et multo latiore quam altiore; inter lorica et caulem longum et tennem est regio quaedam conica. inter calycem et conum est septum: oella habet 1-3 chromatophora pallida, viridia, olivae colori similia: diameter cellae 7-7.6  $\mu$ ; diameter oris loricae 8-9  $\mu$ ; longitudo loricae, cono incluso 7-8  $\mu$ ; caules usque ad 30  $\mu$  longus.

Cell in shallow cup-shaped lorica, which is separated from stalk by a conical region; cup separated from cone by septum: cell with 1-3 pale olive-green chromatophores: cell 7-7.6  $\mu$  in diameter; lorica 8-9  $\mu$  in diameter at its mouth, 7-8  $\mu$  long (including cone); stalk up to 30  $\mu$  long.

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SCHERFFEL, A. Bot. Zeitung, lix. pp. 143-58.

# THE ANNALS AND MAGAZINE OF NATURAL HISTORY

[ELEVENTH SERIES.]

No. 78. JUNE 1944.

XXXVII. - *New Names and New Synonymies*  
Dytiscidae (Col.). By J. BALFOUR BROWNE,  
F.Z.S., F.R.E.S., Dept. of Entomology, British Museum  
(Natural History).

## *Laccophilus biguttatus* Kirby.

*Laccophilus biguttatus* Kirby, Fn. Bor.-Amer. iv, 1837.  
*Laccophilus inconspicuus* Fall, J. New York Ent. S.  
p. 164. (Syn. nov.).

Horn (1883) states: "*L. biguttatus* Kirby  
not a *Laccophilus* at all but seems rather to  
be of *Hydroporus*, perhaps related to *pulcher*.  
The type of the species is in the British Museum and ex-  
amination proves it to be a typical *Laccophilus* belonging  
to the group without a coxal file, consequently it could  
be a synonym of *proximus* Say (1825), as given by Z.  
Mann (1920). The Leng Catalogue (1920) gives it as a  
synonym of *fasciatus* Aubé (1838), but if this synonymy  
were correct *biguttatus* would have priority. Actually  
the species is what was later described by Fall as *inconspicuus*,  
and this name must fall as a synonym.

## *Hyphydrus æthiopicus*, nom. nov.

*Hyphydrus grossus* Sharp (1882) is a homonym of  
*Hyphydrus grossus* (O. Müll., 1776) (*Dytiscus*), which  
name must fall as a synonym. *Ann. & Mag. N. Hist.* Ser. 11. Vol. xi. 24

our-Browne on new Names and

onym of *Hyphydrus ovatus* (Linn., 1758).  
is available for Sharp's species I propose

*Bidessus leai* Guign.

has shown (1939), *Bidessus pusillus* Lea  
homonym of *Bidessus pusillus* (Fabr. 1781)

The journal in which this name was pub-  
little known and it was overlooked by the  
r 1939, which is the reason I have published

*Bidessus geminus* (Fabr.).

th Motschulsky (1856) and Guignot (1939) have  
*pusillus* Fabr. has nine years priority over *geminus*  
though it is treated by Zimmermann (1920) as an  
ion of the latter. The course required by the  
of Nomenclature would lead to the commoner form  
reated as an aberration of the very much rarer form,  
-*Bidessus pusillus* (Fabr., 1781) ab. *geminus* (Fabr.,  
which is a *reductio ad absurdum* since, by definition,  
ration is a non-local departure from the common  
have no hesitation, therefore, in proposing that  
tanding specific name of *geminus* be retained  
ecies and that *pusillus* be restricted to the

*Bidessus granularis*, nom. nov.

*luridus* Lea (1898) is a homonym of *Bidessus*  
, (MacLeay, 1871) (*Hydroporus*), which latter is a  
rm of *Bidessus bistrigatus* (Clark, 1862), and as no  
ame is available I propose *granularis*.

*Sternopriscus hansardii* (Clark).

*Hydroporus hansardii* Clark, Journ. Ent. i. 1862, p. 417. Sharp,  
882, p. 796.

*Sternopriscus clavatus* Sharp, On Aq. Carn. Col. 1882, p. 386. (Syn.  
10v.).

a comparison of the types of *clavatus* Sharp and  
*hansardii* Clark, which was not examined by Sharp, leaves  
doubt of their conspecificity and the name given by  
rk takes precedence. On page 796 Sharp gives Clark's  
mosis and description and adds: "This is a *Sterno-*  
s allied to *S. clavatus*."



*Chostonectes johnsonii* (Clark).

*Hyphydrus johnsonii* Clark, l. c. p. 405. Sharp, l. c. p. 817.

*Chostonectes latus* Sharp, l. c. p. 409. (Syn. nov.)

The unique type of *johnsonii* in the British Museum is a very immature male specimen. There is, however, such a close similarity of the characters of this and the type of *latus* that I have no doubt that they are the same species.

Here again Clark's species was unknown to Sharp in nature, but on page 408, footnote, he writes : " In addition to the four species another but imperfectly known to me should be referred to *Chostonectes*, viz., *Hyphydrus johnsonii* near No. 425."

*Hygrotus (Cælambus) dissimilis*, Gemm. & Har.

*Cælambus dispar* (Lec., 1850) (*Hydroporus*) is a homonym of *Necterosoma dispar* (Germ., 1848) (*Hydroporus*) as had been noted by Gemminger & Harold (1868), who proposed *dissimilis* as a name to replace it. Fall (1919) inadmissibly uses the Lecontean name, relegating *dissimilis* to synonymy, as also does Zimmermann (1920). I here restore the name proposed correctly by Gemminger & Harold.

*Hygrotus (Cælambus) medialis* (Lec.).

*Hydroporus medialis* Lec., Ann. Lyc. Nat. Hist. New York, v. 1851, p. 209.

*Hydroporus infacetus* Clark, Ann. & Mag. Nat. Hist. (3) x. 1862, p. 180. (Syn. nov.)

A comparison of the unique type of *infacetus* in the British Museum, labelled " Mexico," with a long series of *medialis*, leaves no doubt that they are the same species. The Lecontean type came from Southern California : San Diego. According to Fall (1919) the species ranges from Middle and South California to Western Texas, and Northern Mexico is to be added to the range. The Lecontean name has eleven years priority.

*Hygrotus (s. str.) sayi*, nom. nov.

*Hygrotus punctatus* (Say, 1824) (*Hydroporus*) is a homonym of *Hygrotus (Cælambus) punctatus* (Marsh., 1802) (*Dytiscus*), the latter being itself a synonym of *impressopunctatus* (Schall., 1783); *punctatus* (Say) was mis-identified by Crotch (1873) as *inæqualis* (Fabr.). As

no other name is available I propose *sayi*, after the "father" of American Entomology.

*Antiporus bakewellii* (Clark).

*Hydroporus bakewellii* Clark, Journ. Ent. 1. 1862, p. 413.

(\*) *Chostonectes bakewelli* Sharp, l. c. p. 788. Zimmermann, l. c. p. 63.

*Antiporus curtulus* Sharp, l. c. p. 412. (Syn. nov.)

*Hydroporus bakewellii* proves, on examination, to be a typical species of *Antiporus* in the uniformly punctured infero-external face of the posterior tibia, the angular inflation of the intermediate tibiae of the male and the emarginated truncate apices of the elytra, and should be placed next to *blakei* (Clark). Again Sharp did not know the species. On page 408, footnote, Sharp says: "The position of the following is doubtful, but may be in *Chostonectes*, *Hydroporus bakewelli* Clk.; Australia," and on page 788 he gives a copy of Clark's description and hazards the suggestion that "This may perhaps be a species of *Chostonectes*," as the species is listed in Zimmermann (1920).

A comparison of Clark's type with the female type and only specimen of *curtulus* shows the only material distinctions to be in the paler colour of the latter and a slightly greater extension of the black designs, characters not of specific value; *curtulus* must therefore fall as a synonym of *bakewellii*.

*Hydroporus (Scurodytes) lineatus* (Fabr.).

*Dytiscus lineatus* Fabricius, Syst. Ent. 1775, p. 234.

*Hydroporus thoreyi* Clark, l. c. p. 409. (Syn. nov.)

(?) *Necterosoma thoreyi* Zunm., Coleopt. Cat. Junk, Pars. lxxi. 1920, p. 63.

The type and only specimen of *thoreyi* "received from M. Thorey of Hamburg" is in the British Museum and is labelled "Tarangoo, Nov. Holland." A careful examination leaves no doubt whatsoever that it is a specimen of *lineatus*. That species is purely European and there can be no doubt that the locality on Clark's type is accidental. Sharp cannot have examined the specimen and states on page 812: "I do not know any species like this; it somewhat resembles our *Dytiscus lineatus*." I have seen a specimen of *Hydroporus (Stictonotus) lepidus* (Oliv.) from Clark's collection, labelled "Australia," and having a

label with the MS. name *floribundus*, probably in Clark's handwriting. I cannot understand why the species is included by Zimmermann under *Necterosoma*, albeit with a query mark. There is nothing in the description which suggests this genus to my mind and Sharp does not suggest any group but what we now call *Scarodytes*.

*Hydroporus* (s. str.) *pseudopubescens* Zimm.

*Hydroporus pseudopubescens* Zimm., Arch. Naturg. lxxxiii. (1917) 1919, A. xii. p. 166.

*Hydroporus punctatissimus* Popp., Ofvers. Finska Vet. Ac. Handl. xlvii. 1905, p. 14 (*nec* Aubé, 1838).

Zimmermann (1931) reduces *pseudopubescens* to synonymy with *punctatissimus* Popp. The latter is, however, a homonym of *punctatissimus* Aubé (1838), which is itself a synonym of *Hydroporus undulatus* Say (1823), according to Fall (1923). It is therefore necessary to give the name proposed by Zimmermann validity as specific name to replace the homonymous *punctatissimus* Poppius.

*Hydroporus* (s. str.) *mannerheimi*, nom. nov.

*Hydroporus humeralis* Aubé (1838) is a homonym of *Hydroporus humeralis* (Marsh., 1802) (*Dytiscus*), which is given as a synonym of *planus* (Fabr.) by Zimmermann (1920) and which synonymy I have confirmed by an examination of Marsham's type. This homonymy appears to have escaped the notice of American authors, including Fall (1923) in his excellent revision of the American species of the genus. I propose *mannerheimi* in honour of the Finnish author, to whose work on the "Russian American" coleoptera we owe so much.

*Hydroporus* (s. str.) *lucasi* Reiche.

*Hydroporus confusus* Lucas (1849) is a homonym of *Bidessus confusus* (Klug, 1833) (*Hydroporus*). The next name in order of date, *Hydroporus nigriceps* Schaum (1864) is a homonym of *Hydroporus nigriceps* Preller (1862), which is said to be a synonym of *planus* (Fabr.). The valid name will therefore be *lucasi*, proposed by Reiche (1867).

*Hydroporus* (s. str.) *superioris*, nom. nov.

*Hydroporus sericeus* Lec. (1850) is doubly a homonym, being preoccupied by *Hydroporus sericeus* Eschsch. (1818)

which is said to be a synonym of *erythrocephalus* (Linn.), and also by *Hydroporus sericeus* Costa (1847) which is said to be an aberration of *Deronectes luctuosus* (Aubé, 1836). As no other name appears to be available I here propose *superioris*.

*Hydroporus* (s. str.) *guernei* Rég.

*Hydroporus guernei* Rég., Mem. Soc. zool. France, iv. 1891, p. 202.

*Hydroporus guerini* Zimm., Kol. Rundschau, xvii. 1931, p. 128 (err. scrips.).

Zimmermann has made a most unfortunate error in the transcription of the name of this species, which was described from the Azores : Fayal, Caldeira (*J. de Guerne* coll.).

*Hydroporus* (s. str.) *multiguttatus* Rég.

*Hydroporus multiguttatus* Rég., Ann. Soc. ent. France (5) vii. 1877, p. 351.

*Hydroporus multipunctatus* Zimm., l. c. p. 129 (footnote) (err. scrips.).

This is another unfortunate error in transcription.

*Hydroporus* (s. str.) *ferrugineus* Steph.

The recent catalogue of the Danish and Fennoscandian Coleoptera (Héllen *et al.*, 1939) makes the very surprising error of placing this species as a synonym of *obsoletus* Aubé.

Even were they but one species the Stephensian name would have priority ! According to Hansen (1930) *H. obsoletus* (*ferrugineus* Schiødte) occurs in Denmark, but I am unable to find a *ferrugineus* Schiødte in the literature (there is no species of that name in Danm. Eleuth. i. 1841). According to Zimmermann (l. c. p. 155), Heliessen records *obsoletus* from Norway, but he gives no reference as to where this record is to be found. Hansen's species is undoubtedly *obsoletus* Aubé, so the records for South Norway and South Sweden are also probably correct, but *ferrugineus* Steph. must be deleted as a synonym.

*Hydroporus* (s. str.) *teres* Sharp.

*Hydroporus teres* Sharp, l. c. p. 458.

*Hydroporus antidotus* Zimm., Kol. Rundschau, xvii. 1931, p. 127 (nec Sharp, 1882).

Zimmermann's statement that *antidotus* is " In Grösse, Habitus und Mikroskulptur genau mit der vorigen Art (*tesellatus* Drap.) übereinstimmend . . ." is not correct for

Sharp's species, which has the elytra quite shining and unsculptured between the punctures. Under *teres*, which Zimmermann did not know, he says "Veilicht mit *antidotus* Sharp identisch." On the contrary *teres* is, by size, form and sculpture very close to *tessellatus* and abundantly distinct from the types of *antidotus* Sharp. Zimmermann records his *antidotus* from Greece and Malta, whence there is a short series in the British Museum identified by Cameron as *humilis* Klug (see below). A comparison of these specimens with the type of *teres* makes it clear that this is the *antidotus* of Zimmermann's 'Monograph.'

*Hydroporus* (s. str.) *humilis* Klug.

*Hydroporus humilis* Klug, Symb. Phys. iv. 1833, pl. xxxiii. f. 11.  
Zimm. l. c. p. 135.

*Hydroporus antidotus* Sharp, l. c. p. 462 (non Zimm. 1931. (Syn. nov.)

I have little doubt that the above synonymy is correct since, as shown by Zimmermann, it is necessary to treat *humilis* as a good species distinct from *tessellatus*; *antidotus* Sharp has the elytra quite smooth and shining between the punctures, the thorax is black with the lateral margins very narrowly reddish, the antennæ unicolorous, flavous; the dorsum distinctly pubescent; the thorax shining on the disc, anteriorly extremely narrowly, laterally more broadly reticulate as on the head; the venter shining, unreticulate, strongly and distinctly punctured. This agrees exactly with Zimmermann's description of *humilis* on specimens from Jerusalem and fairly well with the not very satisfactory description of Klug on specimen(s) from Sinai. It is also possible that *inscitus* Sharp might be *humilis*, but it is rather larger than the size given by Klug; the type is labelled "Mesopotamia," and I have also seen specimens labelled "Arabia" and "Yemen, Arabia, Millingen."

*Deronectes* (*Potamonectes*) *suavis* Sharp.

*Deronectes suavis* Sharp, l. c. p. 430.

*Hydroporus variegatus* Aubé, Icon. Col. v. 1836, p. 236, pl. xxvii.  
f. 4. (nec Geoffroy in Fourcroy, 1785).

*Deronectes variegatus* (Aubé, 1836) (*Hydroporus*) is a homonym of *Hydroporus variegatus* (Geoffr.) (= *Hydroporus palustris* L.), and accordingly the valid name of the species will be *suavis* Sharp.

*Platynectes kashmiranus*, nom. nov.

*Platynectes lineatus* (Redt., 1844) (*Colymbetes*) is a homonym of *Copelatus lineatus* (Guér., 1830) (*Colymbetes*), and as no other name is available I propose *kashmiranus*.

*Platynectes monostigma* (Hope).

*Colymbetes monostigma* Hope, Ann. & Mag. Nat. Hist. ix. 1842, p. 427.

*Agabus latissimus* Clark, Journ. Ent. ii. 1863, p. 18. (Syn. nov.)

Through the kindness of Professor Hale Carpenter of the Hope Department, University Museums, Oxford, I have been able to examine the type of *monostigma* and to compare it with Clark's type of *latissimus* in the British Museum.

Both are representatives of the same species, which will be known as *monostigma* (Hope).

*Agabus (Gaurodytes) falkenströmi*, nom. nov.

*Agabus dissimilis* Falken. (1938) is a homonym of *Platynectes dissimilis* (Sharp, 1873) (*Agabus*). I have not seen Falkenström's species, which was described from a unique male and which is very close to *vollastomi* Sharp. If it should prove to be a distinct species a new name is required and I propose *falkenströmi*.

*Agabus (Gaurodytes) bedeli* Zaitzev.

*Agabus politus* Reiche, Ann. Soc. ent. France (4) i. 1861, p. 369 (nec Marsham, 1802).

*Agabus bedeli* Zaitzev, Rev. Russe d'Ent. vii. 1907, p. 121.

Zimmermann (1920 and 1931) ignores the clear case made by Zaitzev for the suppression of *politus* Reiche as a homonym of *Agabus politus* (Marsh., 1802) (*Dytiscus*) (= *Agabus paludosus* Fabr.) and lists *bedeli* as a synonym of Reiche's species.

I have examined the type of Marsham's species and confirm that it is a synonym of the Fabrician species, and accordingly *politus* Reiche must be suppressed and the name proposed by Zaitzev restored as the valid name of the species.

*Ilybius quadriguttatus* Lac.

As has been pointed out by Sharp (l. c. p. 973), Jakobson (1908) and Zaitzev (l. c. p. 121), *Ilybius obscurus* (Marsh., 1802) (*Dytiscus*) is a homonym of *Laccophilus*

*obscurus* (Panz., 1795) (*Dytiscus*) and accordingly it must be suppressed.

There seems to be no doubt that *Ilybius quadriguttatus* (Lacord., 1835) (*Colymbetes*) is the same species and, being next in order of date, it must be used as the valid specific name.

*Rantus aberratus* Gemm. & Har.

*Dytiscus adpersus* Fabr. (1801) is doubly a homonym. *Dytiscus adpersus* Panz. (1796) (= *Rantus exsoletus* (Forst., 1771) sec Gschwendtner (1936)) and *Dytiscus adpersus* Illig. (1798) (giving a reference to Panzer) both have precedence, and accordingly the Fabrician name must be suppressed. It is extremely difficult, in view of the confused synonymies in this genus, to decide the valid name for this species if it is, in fact, distinct from *bistriatus* (Bergst., 1778), as has recently been suggested by F. Balfour-Browne (1935).

Of the other names in synonymy with *bistriatus* (Bergst.) in Zimmermann (1920) the next name in order of date is *Rantus agilis* Boisd. & Lac. (1835). This is a homonym of *Rantus agilis* (Payk. 1798) (*Dytiscus*) (= *Rantus suturellus* (Harris, 1828) = *Rantus bistriatus* (Bergst.) (Erich., 1837) sec F. Balfour-Browne) which is, itself, a homonym of *Copelatus agilis* (Fabr., 1792) (*Dytiscus*) (= *Copelatus hæmorrhoidalis* (Fabr., 1787) sec J. Balfour-Browne (1939)), and is accordingly not available.

The next name in order of date is *Rantus nigropunctatus* (Motsch., 1860) (*Rhantus*). This was compared with *adspersus* (Fabr.) in the description, but Zaitzev (1908), after examining the type, states that it is only a colour variety of *bistriatus* (Bergst.). As Zaitzev does not challenge the separate treatment of *bistriatus* (Bergst.) and *adspersus* (Fabr.) in the Hoyden, Reitter and Weise 'Catalogue' (1906), which he is criticizing in the paper, it is to be presumed that he accepted them as distinct species, and therefore *Rantus nigropunctatus* (Mots.) is not available.

The next name in order of date is *Rantus aberratus* (Gemm. & Har.), which was proposed by them for *Rantus adpersus* (Fabr.) (*nec* Panz. Illig.). This name has not been used for any other species in the genus, and accordingly it must be accepted as valid as being the only name

available nomenclatorially. The species should therefore be known as *Rantus aberratus* (Gemm. & Har., 1868).

*Rantus novæ-caledoniæ*, nom. nov.

*Rantus marmoratus* (Perroud, 1864) (*Colymbetes*) is a homonym of *Thermonectus marmoratus* (Hope, 1832) (*Colymbetes*) and must accordingly be suppressed. As no other name is available I propose *novæ-caledoniæ*.

*Rantus virosus*, nom. nov.

*Rantus flavicollis* (Rég., 1887) (*Rhantus*) is a homonym of *Rantus flavicollis* (Eschsch., 1818) (*Colymbetes*), which is probably a synonym of *Rantus notatus* (Fabr., 1781) (*Dytiscus*) (*nec* Bergstr., 1778) and must be suppressed. As no other name is available I propose *virosus*, nom. nov., pro *Rantus flavicollis* (Rég., 1887) (*nec* Eschsch., 1818).

*Rantus frontalis* (Marsh.).

*Dytiscus notatus* Fabricius, Spec. Ins. i. 1781, p. 296 (*nec* Bergstr., 1778).

? *Dytiscus roridus* Muller, Zool. Danm. Prodrum. 1776, p. 72.

*Dytiscus punctatus* Hoppé, Enumerat. Ins., 1795, p. 32 (*nec* Müller, 1776).

*Dytiscus frontalis* Marsham, Ent. Brit. i. 1802, p. 425.

*Dytiscus virgulatus* Illig., Mag. Ins. v. 1806, p. 225.

*Colymbetes flavicollis* Eschsch., Mem. Acad. Petersb. vi. 1818, p. 458.

*Colymbetes suturalis* Boisd. & Lacord., Fn. Ent. Paris, i. 1835, p. 311 (*nec* Macleay, 1825).

*Colymbetes gyllenhalii* Cast., Hist. Nat. Col. i. 1840, p. 162.

*Rhantus sericans* Sharp, On Aq. Carn. Col. 1882, p. 619.

As was pointed out by Zaitzev (*l. c.*), *Rantus notatus* (Fabr., 1781) (*Dytiscus*) is a homonym of *Dytiscus notatus* Bergst. (1778) which, according to Zimmermann (1920) and Gschwendtner (1936), is a synonym of *Agabus nebulosus* (Forst., 1771). This has been overlooked by all subsequent authors, but, being a homonym it must be suppressed.

The next available name, which, if it could be validated would in any case take precedence, is *Dytiscus roridus* O. Müll., but this is accompanied by a description which is completely inadequate and might apply to any of the European species of *Rantus* or to *Agabus nebulosus* and is accordingly best treated as a *species incognitus*.

The next name in order of date, *Dytiscus punctatus* Hoppé is a homonym of *Dytiscus punctatus* Scopoli.



(1763) (= *Acilius sulcatus* (Linn.)), of *Dytiscus punctatus* O. Müll. (1776) (= *Hydroporus dorsalis* (Fabr., 1787)) and also of *Dytiscus punctatus* Geoffr. in Fourcr. (1785) (= *Rantus suturalis* (MacLeay, 1825), *pulverosus* (Steph., 1828)), and is accordingly not available.

The next name in order of date, *Dytiscus frontalis* Marsham, is available, not having been used previously. The type of Marsham is not to be found but the description is quite adequate for this species, and accordingly the specific name must be *Rantus frontalis* (Marsham).

*Hydaticus continentalis*, nom. nov.

*Dytiscus stagnalis* Fabricius, Mant. Ins. i. 1787, p. 191 (nec Fourcr., 1785).

*Hydaticus stagnalis* (Fabr.) is a homonym of *Dytiscus stagnalis* Fourcr. (1785) (= *Dytiscus semisulcatus* O. Müll. (1776)) and must be suppressed. Zimmermann (1920) followed by Geschwendtner (1937) gives *cinctipennis* Aubé (1838), *modestus* Sharp (1882), *americanus* Sharp (1882) and *bimarginatus* Wickham (1895) (= Say, 1834) as synonyms of *stagnalis* (Fabr.).

Wallis (1939) distinguishes the American species from the European species, making *modestus* and *cinctipennis* (probably) distinct species, with *americanus* as synonym of the former. With this treatment I agree, but this leaves the European species without a name and I propose *continentalis*, nom. nov., pro *stagnalis* (Fabr.) (nec Fourcr.).

*Sandracottus mixtus* (Blanch.).

*Dytiscus fasciatus* Fabricius, Syst. Ent. Appendix, 1775, p. 825 (nec Deg., 1774).

*Acilius mixtus* Blanchard, Voy. Pôle Sud, iv. 1853, p. 47, pl. iv. f. 2.

*Sandracottus fasciatus* (Fabr.) is a homonym of *Dytiscus fasciatus* Degeer (1774) (= *Acilius sulcatus* L., ex parte, *A. canaliculatus* Nicol., ex parte), and must be suppressed.

The next name in order of date is that given by Blanchard, and this name is available and will become the valid name of the species.

*Sandracottus wehnckeï*, nom. nov.

*Hydaticus maculatus* Wehncke, Stett. ent. Zeit. xxxvii. 1876, p. 194 (nec Lec., 1854).

*Sandracottus maculatus* (Wehn.) is a homonym of *Hydaticus maculatus* Lec. (1854) (= *Thermonectus mar-*

*moratus* (Hope)) and must be suppressed. As no other name is available I propose *wehnckeï*, nom. nov.

*Thermonectus lepricuri* (Dej.), nom. nov.

*Dytiscus interruptus* Sturm, Cat. 1826, p. 56, pl. 1. f. 3 (*nec* Panz., 1795).

*Thermonectus interruptus* (Sturm) is a homonym of *Dytiscus interruptus* Panz. (1795) (= *Laccophilus hyalinus* (Degeer, 1774)) and must be suppressed. Sharp (l. c. p. 973) has fallen into a peculiar error, as he there shows that Sturm's name is a homonym of that of Panzer but suggests that the species should be known as *interruptus* Aubé. Reference to Aubé shows that it is only by transference that the species has acquired this generic name; he places it in *Acilius*, Division B (*Thermonectus*), and it still remains a homonym. As no other name is available I here propose *lepricuri*, which is included by Aubé as a synonym from Dejean Cat. 3rd edition.

*Dytiscus amurensis*, nom. nov.

*Dytiscus frontalis* Motsch., Bull. Moscou, xxxii. 1859, iii. p. 489 (*nec* Marsh., 1802).

*Dytiscus frontalis* Motsch. is a homonym of *Dytiscus frontalis* Marsh. (1802) (= *Rantus*) and must be suppressed.

As no other name is available I propose *amurensis*, nom. nov.

*Dytiscus alaskanus*, nom. nov.

*Dytiscus parvulus* Motsch., Etudes Ent. i. 1852, p. 77 (*nec* Müll., 1776).

*Dytiscus parvulus* Motsch. is at least four times pre-occupied and must be suppressed. The other uses of the name are as follow :—

*Dytiscus parvulus* O. Müll. (1776) (= ? *Bidessus unistriatus* (Schr.).

*Dytiscus parvulus* Fabr. (1792) (= *Hygrotus inæqualis* Fabr.).

*Dytiscus parvulus* Payk. (1798) (= *Bidessus geminus* Fabr.).

*Dytiscus parvulus* Panz. (1808) (= *Bidessus unistriatus* Schr.).

As no other name is available I propose *alaskanus* nom. nov. pro *parvulus* Motsch. (*nec* Müll., Fabr., Payk., Panz.).

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XXXVIII.—*The Fossil Acrididæ (Orth. Salt.)*.—Part IV.  
*Acrididæ incertæ sedis and Addendum to Catantopinæ* †.  
 By FREDERICK E. ZEUNER, British Museum (Natural History).

THE three parts of this series published up to the present contain those fossil Acrididæ which can be attributed to subfamilies with a reasonable degree of certainty. There remains a large number of fossils which have been described as Acrididæ and even placed in definite genera and subfamilies though, upon examination of the specimens or analysis of the published descriptions and figures, they prove to be devoid of characters sufficient for a diagnosis distinguishing them from other fossil and Recent Acrididæ. 41 such forms are listed here, of which 20 have received specific names. In addition, three genera have been based on fossil Acrididæ *incertæ sedis*.

*Species removed from the Acrididæ.*

Six species described as Acrididæ have been removed from this family and will be discussed in a later paper on

† Part I. Ann. & Mag. Nat. Hist. (11) viii. pp. 510-522 (1941); II. *ibid.* ix. pp. 128-134 (1942); III. *ibid.* ix. pp. 304-314 (1942).

the family Eumastacidæ, to which they possibly belong. These forms are :

- Taphacris reliquata* Scudder.
- Taphacris bittaciformis* (Cockerell).
- Taphacris tillyardi* Cockerell.
- Promastax archaicus* Handlirsch.
- Spec. indet., Eumastacinæ Quiévreux.
- Orthacanthacris rhenana* Théobald.

*Species erroneously described as fossil.*

Another three species have been mentioned by Lomnický (1914, in "Wykopaliska starunskie."—Muz. Imien. Dziedusz. Lemberg) as coming from the upper Pleistocene of Starunia, Polish Carpathians. These are likely to be Recent, however, since it was found that the material of the first excavation was mixed with surface matter which had been buried in an abandoned shaft. The later finds from Starunia, described in earlier parts of this series, are genuine fossils obtained in a new, scientifically conducted excavation. The three species which have to be struck from the list of fossil Acrididæ are :

- Stenobothrus lineatus* (Panz.), Lomnický, 1914, p. 51.
- Stauroderus elegans* (Charp.), Lomnický, 1914, p. 51.
- Stauroderus parallelus* (Zett.), Lomnický, 1914, p. 51.

*Genera of fossil Acrididæ incertæ sedis.*

The majority of the remaining 40 odd forms have been placed in Recent genera, though without morphological justification except, perhaps, for superficial resemblance. Three new genera have been erected for certain fossils, also without the slightest justification. Their names have to be left on record, however, as are those of the named species, for nomenclatorial reasons as well as in the hope that better material may one day be discovered which would make it possible to revive one or the other of these names and to put some meaning into them. The three generic names in question are :

Genus **NANTHACIA** Scudder.

- 1890. *Nanthacia* Scudder, Rep. U.S. geol. Surv. Terr. xiii, p. 224.
- 1909. *Nanthacia* Scudd., Cockerell, Bull. Amer. Mus. nat. Hist. xxvi, p. 81.

*Genotype*.—*Nanthacia torpida* Scudder, 1890.

*Diagnosis*.—"Allied to *Encoptolophus*, but upper ulnar vein of the preanal area of the hind wings not extending

nearly to the margin of the wing but terminating before the middle, as it does in the tegmina, in a fork which extends above to the radial and below to the lower ulnar vein."—(Scudder.)

*Distribution.*—Miocene : Colorado, U.S.A.

*Remarks.*—Based on a single hind wing. In view of the general uniformity in the venation of the hind wings of the Acrididæ, it is difficult to understand how Scudder came to the conclusion that the fossil is allied to *Encoptolophus* Scudd. (Edipodinæ). The venational character described in the diagnosis is one which might occur in a good many other genera also.

### Genus TYRBULA Scudder.

1885. *Tyrbula* Scudder, in Zittel, Handb. Palæont. p. 768.

1890. *Tyrbula* Scudder, Rep. U.S. geol. Surv. Terr. xiii. p. 221.

1909. *Tyrbula* Scudd. : Cockerell, Bull. Amer. Mus. nat. Hist. xxvi. p. 81.

*Genotype.*—*Tyrbula russelli* Scudder, 1885.

*Diagnosis.*—"Falling in close proximity to *Syrbula* Stål, having linear antennæ, enlarged apically, and hind tibiæ well provided with spines. Antennæ more distinctly clubbed than in *Tyrbula*, the club being about twice the diameter of the stalk, composed of seven or eight joints, of which the last two are very small, forming a rapidly tapering tip. Head less prominent than in *Tyrbula* and eyes considerably smaller, being considerably shorter than the infraocular parts of the cheeks. Hind tibiæ abundantly spined"—(Scudder slightly shortened.)

*Distribution.*—Upper Eocene and Miocene : North America

*Remarks.*—Two species are included, the genotype from the Miocene of Florissant, Colorado, and *T. multispinosa* Scudd. from the Green River Eocene and the Miocene of Florissant. Scudder described the genus as "new" in 1890, disregarding the first publication of the name, with figure, in 1885. Genotype is *T. russelli* Scudder, 1885, by monotypy, and Cockerell's designation of *T. multispinosa* (1909) invalid.

Scudder considered *Tyrbula* as an acridine genus on account of the general proportions and the clubbed antennæ. Clubbed antennæ, however, also occur in the

Catantopinae. The smallness of the eyes speaks most emphatically against the Acridinae. The venation, which would settle the point, has not been described.

(Genus MENATACRIDIUM Piton)

1936. *Menatacridium* Piton, Misc. ent. xxxvii. p. 78.

1937. *Menatacridium* Piton, Misc. ent. xxxviii. p. 1.

1937. *Menatacridium* Piton, Rev. Sci. nat. Auvergne, iii. (2) p. 9.

*Genotype*.—*Menatacridium eocenicum* Piton, 1936.

*Diagnosis*.—"Impossible d'assimiler à aucun genre vivant."--(Piton.)

*Distribution*.—Lower Eocene: Auvergne, France.

*Remarks*.—See species, p. 363.

*List of species of fossil Acrididæ insertæ sedis.*

In the following list, the named species are arranged alphabetically and followed by the unnamed species, which have received numbers for the purpose of easy reference. Forms attributed originally to the same genus, therefore, are *not* listed together. Forms described as members of existing genera appear under the heading gen. indet., and only the genotypes of the three genera erected for fossil species appear under definite generic names. The synonymic lists under each heading will reveal at a glance what the original author called the form.

Acrididæ, gen. indet. *abstrusus* (Scudder).

1890. *Gomphocerus abstrusus* Scudder, Rep. U.S. geol. Surv. Terr. xiii. p. 223, pl. xvii. fig. 6.

1891. 2385. *Gomphocerus abstrusus* Scudder, Bull. U.S. geol. Surv. lxxi. p. 309.

1907. (*Gomphocerus*) *abstrusus* Scudder, Handlirsch, Fossile Insekten, p. 687.

*Distribution*.—Miocene: Florissant, Colorado.

*Holotype*.—Scudder Coll., Museum of Comparative Zoology, Harvard University, nos. 635 and 11,736 (one specimen).

*Parts known*.—Anterior portion of body with head and parts of wings.

*Remarks*.—"It does not seem, on several accounts, to belong in the genus."--(Scudder.) Face very oblique. Indeterminable.



*Acrididæ*, gen. indet. *barthelemyi* (Hope).

1848. *Acridium* (*Grillus*) *Barthelemyi* Hope, *Descrizione insetti fossili*, p. 5, pl. i. fig. 2. (See Zeuner, 1939, *Fossil Orthoptera Enaifera*, p. 301.)  
 1885. *Acridium barthelemyi* Hope, Scudder, in Zittel, *Handb. Paläont.* p. 768.  
 1886. *Acridium barthelemyi* Hope, Scudder, in Zittel & Barrois, *Traité paléont.* ii. p. 768.  
 1886. *Acridium barthelemyi* Hope, Scudder, *Bull. U.S. geol. Surv.* xxxi. p. 49.  
 1890. *Acridium barthelemyi* Hope, Scudder, *Rep. U.S. geol. Surv. Terr.* xiii. p. 220.  
 1891. 2331. *Acridium barthelemyi* Scudder, *Bull. U.S. geol. Surv.* lxxi. p. 303.  
 1891. 2332. *Acridium* (*Gryllus*) *barthelemyi* Scudder, *Bull. U.S. geol. Surv.* lxxi. p. 303.  
 1891. *Gryllus barthelemyi* Scudder, *Bull. U.S. geol. Surv.* lxxi. p. 309.  
 1907. (*Acridium*) *barthelemyi* Hope, Handlirsch, *Fossile Insekten*, p. 687.

*Distribution*.—Stampian, Middle Oligocene: Aix-en-Provence, France.

*Holotype*.—Not traced.

*Parts known*.—Complete specimen lying on one side, with closed wings.

*Remarks*.—Indeterminable. The figure is too vague for the distinction of diagnostic characters.

*Menatacridium eocenicum* Piton.

1936. *Menatacridium eocenicum* Piton, *Misc. ent.* xxxvii. p. 78, fig. 1.  
 1937. *Menatacridium eocenicum* Piton, Piton, *Misc. ent.* xxxviii. p. 1, fig. 3.  
 1937. *Menatacridium eocenicum* L. Piton, Piton, *Rev. Sci. Auvergne*, iii (2) p. 9.

*Distribution*.—Lower Eocene: Menat, Auvergne, France.

*Holotype*.—Coll. L. Piton, Jouet-sur-Aubois (Cher, France), no. 51.

*Second specimen*.—Coll. Guillot, St. Pourçain-sur-Sioule (Allier, France), no. 1.

*Parts known*.—Holotype, wing (? elytron, ? part of hind wing). Second specimen, head, body, legs, antennæ, wings.

*Remarks*.—The holotype is regarded by Piton as an elytron. This interpretation is suggested by the anal area of the specimen. The venation near the costal margin, however, suggests a hind wing, the cross-veins being all vertical to the margin and to the Sc.

If one interprets the specimen as the elytron of an acridid, some difficulties arise. *Sc* is connected with the fore-margin by straight and vertical cross-veins. *R* is a straight vein with a simple terminal fork. *Rs* is an independent vein from the base of the wing. (This is impossible; either there is some misinterpretation of the fossil, or the fossil does not belong to the *Acrididæ*.) *M* shows two long and straight branches in the basal quarter, and three short ones in the apex. Between *M* and *Sc* all interspaces contain one row of cells only. All these characters are very strange.

There is no trace of a discoidal cell.

The cubito-anal region is more acridid-like. There are two branches of *Cu*, somewhat vague distally because of bad preservation. *3A* joins *2A* in the form of a *Y*. *4A* is long and submarginal (this, again, is one of the strange features of the fossil).

This wing is 14.5 mm. long and its greatest width is 2.25 mm. The greatest width is very close to the base.

Assuming all the time that the fossil is an acridid elytron, the last-mentioned feature, namely, the greatest width being so close to the base, might suggest that it is the elytron of a large, brachypterous species. In brachypterous *Acrididæ*, the discoidal cell disappears frequently, and the venation may become very aberrant. The straight cross-veins of the fore portion of the vein, however, cannot be explained in this way.

The second specimen (Piton, 1937, Misc. ent.) is an acridid with the hind wings partly opened. There are no reliable diagnostic features which would permit of identifying it with the holotype or of describing it as a clearly-defined species.

This specimen is exceedingly small for an acridid: length of wings (regarded as elytra by Piton), 10 mm.; length of abdomen, 8 mm., length of hind femora, 5 mm.

One most surprising feature is mentioned by Piton. The antennæ of the second specimen, which are preserved, are composed of at least thirty-five segments. Piton states that the number must in reality be greater, since short portions of the antennæ are evidently missing. This number is too high for any Recent *Acrididæ*, and it therefore would be well worth while to study this specimen

again. If Piton's counting can be confirmed, the specimen would represent a hitherto unknown group.

Acrididæ, gen. indet. *femoralis* (Heer).

1849. *Gomphocerus femoralis* Heer, Insektenfauna Ceningen Radoboj, ii. p. 20, pl. i. fig. 7.  
 1852. *G. femoralis* Heer, Giebel Deutschl. Petref. p. 638.  
 1854. *Gomphocerus femoralis* Pictet, Traité paléont. p. 365, pl. xl. fig. 16.  
 1856. *G. femoralis* Giebel, Fauna Vorwelt, ii. (1) p. 309.  
 1885. *Gomphocerus femoralis* Hunner Scudder, in Zittel, Handb. Palæont. p. 768.  
 1886. *Gomphocerus femoralis* Heer, Scudder, in Zittel & Barrois, Traité paléont. ii. p. 768.  
 1886. *Gomphocerus femoralis* Scudder, Bull. U.S. geol. Surv. xxxi. p. 49.  
 1890. Species . . . from Ceningen, Scudder, Rep. U.S. geol. Surv. Terr. xiii. p. 223.  
 1891. 2386. *Gomphocerus femoralis* Scudder, Bull. U.S. geol. Surv. lxxi. p. 309.  
 1907. (*Gomphocerus*) *femoralis* Heer, Handlirsch, Fossile Insekten. p. 688.  
 1928. *Stenobothrus femoralis* Heer, Pongrácz, Ann. Mus. hung. Budapest, xxv. p. 146.

*Distribution*.—Miocene: Ceningen and Radoboj. Type-locality, Sarmatian, Upper Miocene: Ceningen, Lake Constance.

*Holotype*.—Coll. Seyfried, Gymnasium, Constance, Baden.

*Other specimens*.—Two from Radoboj, Croatia, described by Pongrácz, 1928.

*Parts known*.—Complete specimen with wings closed, lying on one side.

*Remarks*.—About 17 mm. long. Nodiagnostic features preserved, except for the thick hind femora. In Heer's time, *Gomphocerus* covered all the genera now comprised by the Gomphocerini, but it is evident that the fossil form cannot be assigned to any particular group of the Acrididæ.

1865. *Edipoda fischeri* Heer, Urwelt Schweiz, p. 367, fig. 224.  
 1872. *Edipoda fischeri* Heer, Monde prim. Suisse, p. 450, fig. 224.  
 1876. *Edipoda fischeri* Heer, Prim. World Switz. ii. p. 20, fig. 224.  
 1879. *Edipoda fischeri* Heer, Urwelt Schweiz, 2nd ed. p. 391, fig. 265.  
 1890. *O. fischeri* Scudder, Rep. U.S. geol. Surv. Terr. xiii. p. 224.  
 ("Looks somewhat like a *Chimarocephala*."  
 1891. 2437. *Edipoda fischeri* Scudder, Bull. U.S. geol. Surv. lxxi. p. 314.

1891. 2368. *Chimarocephala fischeri* Scudder, Bull. U.S. geol. Surv. lxxi. p. 307.

1907. (*Chimarocephala*) *fischeri* Heer, Handlirsch, Fossile Insekten, p. 688.

*Distribution*.—Sarmatian, Upper Miocene: Ceningen, Lake Constance.

*Holotype*.—Geologisches Institut und Museum der Eidgenössischen Technischen Hochschule, Zürich, Switzerland (?).

*Parts known*.—Complete specimen in resting position.

*Remarks*. Assuming that Heer's figure is in natural size, about 25 mm. long from head to tip of elytra. General aspect reminiscent of a *Pyrgomorpha*, but elytra too short and broad and hind femora too thick and short. Thorax and head are obviously not accurately drawn. Indeterminable.

#### Acrididæ, gen. indet. *germari* (Heer).

1865. *Ædipoda germari* Heer, Urwelt Schweiz, p. 367.

1872. *Ædipoda germari* Heer, Monde prim. Suisse, p. 450.

1876. *Ædipoda germari* Heer, Prim. World Switz. ii. p. 20.

1879. *Ædipoda germari* Heer, Urwelt Schweiz, 2nd ed. p. 391.

1888. *Pachytilus* Schöberlin, Soc. entom. iii. p. 51. (Partim.)

1890. *O. germari* Scudder, Rep. U.S. geol. Surv. Terr. xiii. p. 224.

1891. 2438. *Ædipoda germari* Scudder, Bull. U.S. geol. Surv. lxxi. p. 314.

1907. (*Ædipoda*) *germari* Heer, Handlirsch, Fossile Insekten, p. 688.

*Distribution*.—Sarmatian, Upper Miocene: Ceningen, Lake Constance, Baden.

*Holotype*.—? Museum der Eidgenössischen Technischen Hochschule, Zürich, Switzerland.

*Parts known*.—Complete specimen.

*Description*.—"Has the size and shape of the migratory locust and dark-spotted elytra, but is badly squashed."—(Heer, 1865.)

*Remarks*.—There is no figure, and the description is utterly insufficient.

#### Acrididæ, gen. indet. *haidingeri* (Heer).

1865. *Ædipoda haidingeri* Heer, Urwelt Schweiz, p. 367, fig. 223.

1872. *Ædipoda haidingeri* Heer, Monde prim. Suisse, p. 450, fig. 223.

1876. *Ædipoda haidingeri* Heer, Prim. World Switz. ii. p. 20, fig. 223.

1879. *Ædipoda haidingeri* Heer, Urwelt Schweiz, 2nd ed. p. 391, fig. 264.

1890. *O. haidingeri* Scudder, Rep. U.S. geol. Surv. Terr. xiii. p. 224. ("Probably a *Disosteira*.")

1891. 2439. *Ædipoda haidingeri* Scudder, Bull. U.S. geol. Surv. lxxi. p. 315.

1891. 2375. *Dissosteira haidingeri* Scudder, Bull. U.S. geol. Surv. lxxi. p. 307.

1907. (*Dissosteira*) *haidingeri* Heer, Handlirsch, Fossile Insekten, p. 687.

*Distribution*.—Helvetian, Lower Miocene: Radoboj, Croatia.

*Holotype*.—Geologische Bundesanstalt, Vienna, no. 74 a, b.

*Parts known*.—Complete specimen with wings in position of rest.

*Description*.—Head to tip of elytra, 47 mm. Stouter than *Euprepocnemini*, gen. indet. *melanosticta* (Sharp.) (see this paper, Part I. p. 514). Heer's figure reproduces the general proportions fairly well.

*Remarks*.—The specimen and its counterpart are labelled as *Ædipoda imperialis* and *Ædipoda melanosticta*, respectively. Indeterminable.

Acrididæ, gen. indet. *hungarica* (Pongrácz).

1928. *Pardalophora hungarica* Pongrácz, Ann. Mus. hung. xxviii. p. 139, p. 149, figs. 23, 24 b.

*Distribution*.—Helvetian, Lower Miocene: Radoboj, Croatia.

*Holotype*.—Royal Hungarian Geological Survey, Budapest.

*Parts known*.—Left elytron, apex destroyed.

*Remarks*.—Pongrácz's reconstruction, fig. 23, is misleading, as it gives the complete insect with body and hind wing, though the elytron only is known. It is based on the assumption that the specimen is a *Pardalophora*. It is difficult to see what induced the author to consider his view as correct, except possibly the black bands of the elytron. Such pattern of bands is frequent in the Recent *Ædipodinae*, but in many other subfamilies it is found also. There is no discoidal vein in Pongrácz's species, and this rules out the *Ædipodinae*, and *Pardalophora* Saussure with them. A very peculiar set of straight, oblique cross-veins is shown in the discoidal cell in the author's fig. 24 b. This character, as well as some others, needs verification before an attempt can be made at placing this fossil.

\* Acrididæ, gen. indet. *kudiana* (Cockerell). (Fig. 1.)

H 1927. *Tryxalis* (s. lat.) *kudiana* Cockerell, Ann. & Mag. Nat. Hist. (9) xx. p. 593, fig. 2.

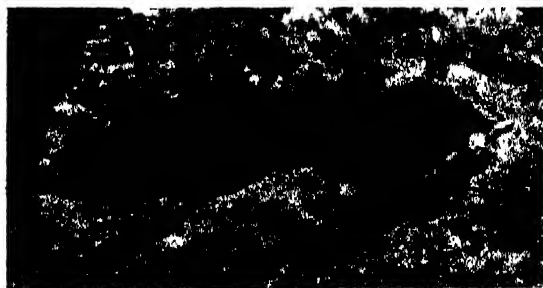
*Distribution*.—Tertiary: Kudia River, Siberia.

*Holotype*.—British Museum (Natural History), In. 26942.

*Parts known*.—Portions of elytron and hind wing.

*Description*.—"Tegmen long and narrow, about 20 mm. long, width about 3.3 mm. Rather dilute brown, the nervures darker, a prominent dusky shade along anal margin below the short anal."

Fig. 1.



*Remarks*.—Of the total length, 17 mm. are preserved.

Cockerell regarded this wing as an elytron. The specimen is marked as *Ædipoda kudiana* (obviously meant in the generalized sense as used by Heer) but, in describing it, the author considered that "the insect almost certainly belongs in the Tryxalinæ" (=Acridinæ).

Re-examining the specimen, I find that the veins as seen in the photograph (fig. 1) belong to two levels, the basal portion and an island in the apex being low, and the middle portion and part of the external margin slightly raised. The venation of each level breaks off along fractures of the rock. It is evident, therefore, that Cockerell's drawing is a composition of two superimposed wings. The straight and widely-spaced cross-veins of the basal portion suggest that the lower level represents the hind wing; the upper level, therefore, is the elytron.

If one separates elytron and hind wing in this manner, there remains nothing suggesting affinities. I agree with Cockerell, however, in placing the fossil in the Acrididæ.

Acrididæ, gen. indet. *lineata* (Théobald).

1937. *Orthacanthacris lineata* Théobald, Ins. foss. Terr. olig. France, p. 117, pl. i. fig. 2.

*Distribution*.—Sannoisian, Lower Oligocene: Célas (Gard), France.

*Holotype*.—Marseilles Museum, no. C 8.

*Paratype*.—Marseilles Museum, no. C 11.

*Parts known*.—Hind wing (holotype), and traces of body (paratype).

*Description*.—Length of hind wing, 65 mm. (estimated by author; according to figure, 44 mm. preserved.)

5 to 6 branches of *Rs*.

*Remarks*.—I am not convinced that this is a hind wing, since the venation in the apex is more like that of an elytron. If it is an elytron, portions of the hind wing are preserved also, the two being partly superimposed.

There are no characters present which might suggest the systematic position within the Acrididæ. The author compared the fossil form with *Orthacanthacris flavescens* Fab., but there are hundreds of Recent Acridæ which would have served the same purpose.

\* Acrididæ, gen. indet. *longipennis* (Pongrácz).

—, *Edipoda longipennis* Heer, old label in the coll. of the Geologische Bundesanstalt, Vienna, no. 336.

1928. *Edipoda longipennis* Pongrácz, Ann. Mus. hung. Budapest, xxv. p. 137.

*Distribution*.—Helvetian, Lower Miocene: Radoboj, Croatia.

*Holotype*.—Geologische Bundesanstalt, Vienna, no. 336.

*Parts known*.—Complete specimen with folded wings. Hind tibiæ missing.

*Description*.—According to Pongrácz, from head to tip of elytra, 48 mm., length of elytra, 40 mm., width 5 mm.

“Head surprisingly small, carinæ of thorax present and pronounced, prominent posteriorly, forming a bulge as in *Thrinchus*. Thorax with three lateral furrows. Wings narrow, long, with nearly parallel margins, without the enlargement of the costal area observed in *Edipodids*. Femur on the inner side probably with two large, sharply separated, quadrangular spots.”—(Pongrácz.)

*Remarks*.—The “bulge” of the pronotum (called thorax by the author) is that over the base of the elytra,

a very common feature in Acrididæ. I have seen the specimen and been unable to detect any characters suggestive of its systematic position. It belongs, perhaps, to Euprepocnemini, gen. indet. *imperialis* (Pongrácz) (see this paper, Pt. I. p. 516).

*Tyrbula multispinosa* Scudder.

1890. *Tyrbula multispinosa* Scudder, Rep. U.S. geol. Surv. Terr. xiii. p. 221, pl. xvii. fig. 13.

1891. 2463. *Tyrbula multispinosa* Scudder, Bull. U.S. geol. Surv. lxxi. p. 318.

1907. *Tyrbula multispinosa* Scudder, Handbrosch, Fossile Insekten, p. 686.

*Distribution.*—Upper Eocene: Green River, Wyoming, U.S.A.—Miocene: Florissant, Colorado, U.S.A.

*Holotype.*—Scudder Coll., Museum of Comparative Zoology, Harvard University, no. 138 P+140 P. From Green River. (Folded hind wing.)

*Doubtfully referred to this species.*—Same coll., no. 14720, from Florissant.

*Parts known.*—Hind legs, and fragments of hind wings.

*Description.*—Length of femur, 17.5 mm., width, 3.5 mm. Longest tibial spines, 0.8 mm. Length of hind wings, 23.5 mm.

According to Scudder, the tibial spines are exceptionally numerous in this species, their number probably exceeding 25. They are "blackish, of uniform width to beyond the middle, and then tapering, mainly by the excision of the under edge, giving them a slightly upturned appearance, five or six times longer than their breadth at the middle, and so closely set that the interspaces and the spines are of equal breadth."

In most Acrididæ, the number of tibial spines on each side of the hind tibia is between 10 and 13, though in the Acridinæ (*Acrida turrata* L., for instance) it rises to about 27. In the Eumastacidæ, the outer row contains about 25 to 27, the inner row a smaller number, at least in several unrelated genera. The character given by Scudder, therefore, does not enable one to place the fossil.

Only one specimen shows these characters, and this must be regarded as the holotype. The specimen from Florissant is the one appearing on Scudder's figure; it is only tentatively assigned to this species.



Acrididæ, gen. indet. *œningensis* (Heer).

1755. Knorr, Merkwürdigkeiten der Natur, pl. xxxiii. fig. 5 (?).  
 1849. *Ædipoda œningensis* Heer, Insektenfauna Eningen Radoboj, u. p. 20, pl. n. fig. 4.  
 1852. *Æ. œningensis* Heer, Giebel, Deutschlands Petrefacten, p. 637.  
 1856. *Æ. œningensis* Giebel, Fauna Vorwelt, u. (1) p. 308.  
 1890. *O. œningensis* Heer, Scudder, Rep. U.S. geol. Surv. Terr. xiii. p. 225.  
 1891. 2442. *Ædiopda œningensis* Scudder, Bull. U.S. geol. Surv. lxxi. p. 315. (Sic, printer's error.)  
 1907. (*Ædipoda*) *œningensis* Heer, Handlirsch, Fossile Insekten, p. 688.

*Distribution.* Sarmatian, Upper Miocene: Eningen, near Lake Constance, Baden, Germany.

*Holotype.*—Museum of the Eidgenössische Technische Hochschule, Zurich, Switzerland (?).

*Parts known.*—Entire specimen with wings folded.

*Remarks.*—This specimen measures about 50 mm. from the head to the tip of the elytra. Its front is very oblique. It is badly preserved, and there are no other distinctive characters. Pongrácz confused this form with *Euprepocnemini*, gen. indet. *imperialis* (Pongrácz), from the lower Miocene of Radoboj (see this paper, Pt. I. p. 510).

\*Acrididæ, gen. indet. *partschi* (Pongrácz).

- \*——. *Ædipoda partschi* Heer, labels in the coll. of the Geologische Bundesanstalt and the Staatsmuseum, Vienna.  
 1928. *Ædipoda Partschi* Pongrácz, Ann. Mus. hung. Budapest, xxv. p. 146. (First description.)  
 1928. *Scyllina œningensis (Partschi)* Heer, Pongrácz, Ann. Mus. hung. Budapest, xxv. fig. 27 (p. 145). (Sic.)  
 1928. *Ædipoda Partschi* Heer, Pongrácz, Ann. Mus. nat. Hung. xxv. p. 132. (Partim syn. of *Bryodema croatica* Pongrácz according to Pongrácz.)  
 1928. *Ædipoda Partschi* Heer, Pongrácz, Ann. Mus. nat. Hung. xxv. p. 135 to 136, line 8. (Regarded as *Bryodema* sp. by Pongrácz.)  
 1942. *Ædipoda partschi* Heer, Zeuner, Ann. & Mag. Nat. Hist. (11) ix. p. 129, p. 130.

*Distribution.*—Lower Miocene: Radoboj, Croatia.

*Holotype.*—Specimen figured by Pongrácz (1928, fig. 27), possibly Geologische Bundesanstalt, Vienna, no. 596. Pongrácz says that this specimen is in the "Wiener Geologisches Institut." by which he presumably means the Bundesanstalt.

*Other specimens.*—Other specimens which have been labelled "*Ædipoda partschi*," but need not be, and

probably are not, conspecific with the holotype, are the following :

(1) A specimen, without number, in the Vienna Museum of Natural History. I have seen it and convinced myself that it is indeterminable. Possibly mentioned by Pongrácz, 1928, p. 135, lines 25 to 136, line 8.

(2) Specimen no. 204 in the Vienna Geologische Bundesanstalt. This specimen agrees with the description given by Pongrácz, 1928, p. 135-136, though he states that his specimen is preserved in the "Staatsmuseum" (=Naturhistorisches Museum). It is tentatively assigned to *Bryodema* sp. by Pongrácz, but is smaller than *B. croatica* Pongrácz, its hind-femur measuring only 15.5 mm. It agrees with this species in the pattern of the fore wing.

*Remarks.*—This is a highly doubtful species. *Æ. partschi* had been a MS. name for some eighty years, when Pongrácz inadvertently, but validly described a specimen under this name.

Acrididæ, gen. indet. *præfocata* (Scudder).

1890. *Ædipoda præfocata* Scudder, Rep. U.S. geol. Surv. Terr. xiii. p. 225, pl. xvii. fig. 5.

1891. 2443. *Ædipoda præfocata* Scudder, Bull. U.S. geol. Surv. lxxi. p. 315.

1907. (*Ædipoda*) *præfocata* Scudder, Handlirsch, Fossile Insekten, p. 687.

*Distribution.*—Miocene : Florissant, Colorado.

*Holotype.* - Museum of Comparative Zoology, Harvard University, Scudder's no. 7389.

*Parts known.*—Portions of fore and hind wings.

*Remarks.*—No characters are preserved which might indicate the systematic position of this fossil.

\*Acrididæ, gen. indet. *pulchra* (Pongrácz).

\*—. *Ædipoda pulchra* m. Heer, on label of no. 76, Vienna Bundesanstalt.

H.P. 1928. *Ædipoda* (*Chortiocetes* ?) *pulchra* Pongrácz, Ann. Mus. hung. Budapest, xxv. pp. 136-137, fig. 21.

*Distribution.*—Helvetian, Lower Miocene : Radoboj, Croatia.

*Holotype.*—Geologische Bundesanstalt, Vienna, no. 75. (Herewith selected.)

*Paratype.*—Same collection, no. 76. (Herewith selected.)

*Tentatively referred to this species.*—A specimen in the exhibition gallery of the Naturhistorisches Museum,

Vienna, labelled *Ædipoda melanosticta*, without number. Possibly counterpart of the paratype.

*Parts known.* —Complete specimens.

*Remarks.*—The specimen here selected as holotype is the lower one figured by Pongrácz, p. 137, fig. 21. This author regarded the name as Heer's, but since it had never been published and since he uses it for the first time, he becomes the author.

In shape, *Ædipoda pulchra* reminds one of a *Sphingonotus*. It is a fairly large form, the elytra being 31 mm. long and the total length from the head to the end of the elytra amounting to 40 mm. No discoidal vein is recognisable, the species therefore cannot be placed in the *Ædipodinae*.

According to Pongrácz, the venation is "almost quite indistinctly" preserved. On his figures, or reconstructions, however, considerable details of the venation are shown which I was unable to verify when studying the specimens. The two specimens disagree in the pattern, the holotype having two large cross-bands running from the costal margin towards the anal margin without reaching it, a round spot near to the base, and five short cross-bands extending over less than half the width of the apex. These five bands and the round spot are absent in the paratype which, moreover, has the large cross-bands spaced more widely apart.

Pongrácz tentatively connects these fossils with *Chortocetes*, a genus exhibiting the discoidal vein, but unlike *Ædipoda* in the venation. The systematic position of this species remains entirely problematic.

### *Tyrbula russelli* Scudder.

1885. *Tyrbula russelli* Scudder, in Zittel, Handb. Paläont. (I.) ii. fig. 965 (p. 168). (This is the first valid publication of the name.)

1886. *Tyrbula russelli* Scudd., Scudder, in Zittel & Barrois, Traité paléont. ii. fig. 982 (p. 768).

1890. *Tyrbula russelli* Scudder, Rep. U.S. geol. Surv. Terr. xiii. p. 222, pl. xvii. figs. 1-4.

1891. 2464. *Tyrbula russelli* Scudder, Bull. U.S. geol. Surv. lxxi. p. 318.

1907. *Tyrbula russelli* Scudder, Handlirsch, Fossile Insekten, p. 687.

*Distribution.*—Miocene: Florissant, Colorado.

*Holotype.*—Museum of Comparative Zoology, Harvard University, no. 7. Specimen figured by Scudder, pl. xv. figs. 1-4.

*Paratype.*—Same collection, no. 468 (Scudder's no. 14,175). I am indebted to Dr. F. M. Carpenter for communicating the registration numbers.

*Parts known.*—Two complete females.

*Measurements.*—Length of body, 23 mm., of antennæ, 10 mm., of elytra, 18 mm., of hind femora, 14.5 mm.

*Remarks.*—See p. 361.

The spines of the hind tibia are less numerous than in *T. multispinosa* Scudder (p. 370), about 18 or 20, which is still unusually high for the Acrididæ. The antenna is clubbed.

Acrididæ, gen. indet. *saussurei* (Théobald).

1829. *Gryllus* Serres, Géogn. terr. tort. p. 226.

1856. *Gryllus* Giebel, Fauna Vorwelt, ii. (1) p. 309.

1890. *Ædipoda* Scudder, Rep. U.S. geol. Surv. Terr. xiii. p. 225.

1891. 2436. *Ædipoda* Scudder, Bull. U.S. geol. Surv. lxxi. p. 314.

1907. (*Ædipoda*)—Serres, Handlirsch, Fossile Insekten, p. 687.

1937. *Ædipoda saussurei* Théobald, Ins. foss. terr. olig. France, p. 293, pl. xx. figs. 20, 21.

*Diagnosis.*—Total length from head to tip of elytra, 21 mm., hind femur, 10 mm. Head with strongly inclined face, almost conical, but vertex rounded.

*Distribution.* Stampian, Middle Oligocene: Aix-en-Provence, France.

*Holotype.*—Coll. Coquand, École des Mines, Paris, no. 21.

*Paratype.*—Same collection, no. 20.

*Parts known.*—Two complete specimens with folded wings.

*Description.*—Length from head to tip of elytra, 21 mm., from head to tip of abdomen, 16.5 mm., elytra 16 mm., hind femur, 10 mm., hind tibia, 9 mm., antennæ 7 mm.

Head comparatively small, front strongly inclined, but vertex rounded. Pronotum with distinct transverse sulci. Hind femur about the length of the abdomen, fairly slender.

*Remarks.*—Théobald's description is based on both the holotype and the paratype and contains no character which might indicate the generic position of the fossils, or even the subfamily. The strongly inclined front, however, definitely excludes the *Ædipodinae*, to which the author is convinced the fossils belong.

Furthermore, the two specimens most probably belong to different genera. The paratype has much shorter hind

legs than the holotype, shorter antennæ and larger eyes. The eyes of the paratype, as seen from above, look rather peculiar, being too large and rounded and yet not prominent enough, unlike those of any other Acrididæ. It is possible that Théobald misinterpreted lines on the fossil as presenting the contours of the eyes. In the holotype, on the other hand, the eyes are represented as being very small, in fact smaller than in any known Acridid.

The chief features of the body, and the hind legs, however, leave no doubt that both specimens belongs to the Acrididæ proper.

*Tyrbula scudderi* Cockerell.

1914. *Tyrbula scudderi* Cockerell, Entomologist, xlvii. p. 33, fig. 1.

*Distribution*.—Miocene: Florissant, Wilson Ranch, Colorado.

*Holotype*.—Cockerell Collection, the leg, fig. 1 B.

*Paratype*.—Same collection, the elytron, fig. 1 A. The author mentions no collection in which the specimens are preserved; it is assumed, therefore, that they are contained in his own. The specimens were collected by H. F. Wickham.

*Parts known*. Hind leg and elytron.

*Description*.—*Holotype*. "Femur  $17\frac{1}{2}$  mm. long,  $3\frac{1}{2}$  wide, superior carinæ strongly marked; many broad oblique brown bars, broader than the intervals between them. Tibia of same leg  $18\frac{3}{4}$  mm. long,  $\frac{1}{2}$  mm. wide, the hind margin with sixteen large, two medium, and four small spines, the uppermost (small) one  $3\frac{1}{2}$  mm. from base of tibia, the first large spine 7 mm. from base; the large spines formed as in *T. multispinosa*, but so closely set that their bases almost touch, and the longest spines are nearly  $1\frac{1}{2}$  mm. long; the longer spine at apex of tibia is about 1 mm. long. Tarsus 6 mm. long."

*Paratype*. Elytron as preserved about 29 mm. long, if complete, about 32 mm. Width about 5 mm. Pattern a slight indistinct marbling, no distinct spots or bands. Precostal area broadly expanded in the basal half. *M* only two-branched, behind this vein specialized cross-venation. It is not clear, however, whether the following longitudinal vein is *CuA* or a discoidal vein.

*Remarks*.—Cockerell feels confident that the elytron belongs to the same species as the leg, but cautiously

makes the leg the holotype, since it can be compared with the other two species described under the name of *Tyrbula*.

*Nanthacia torpida* Scudder.

1890. *Nanthacia torpida* Scudder, Rep. U.S. geol. Surv. Terr. xiii. p. 224.

1891. 2432. *Nanthacia torpida* Scudder, Bull. U.S. geol. Surv. lxxi. p. 314.

1907. *Nanthacia torpida* Scudder, Handlirsch, Fossile Insekten, p. 687.

*Distribution*.—Miocene: Florissant, Colorado.

*Holotype* Museum of Comparative Zoology, Harvard University, Scudder's no. 9100.

*Parts known*.—Hind wing.

*Remarks*.—See p. 360.

Acrididæ, gen. et sp. indet., no. 1.

1928. "erinnert sehr an *Acrotylus*": Pongrácz, Nov. Act. Leop. (n. s.) ii. (6) p. 527, pl. 1. fig. 7.

*Distribution*.—Lutetian, Middle Eocene Brown Coal: Geiseltal near Halle a.S., central Germany.

*Specimen*.—Department of Geology, University of Halle

*Parts known*.—Hind leg

*Remarks*.—No description or measurements. Figure indistinct.

Acrididæ, gen. et sp. indet., no. 2.

1870. Orthoptère: Oustalet, Ann. Soc. géol. France, ii. p. 78, pl. u g. 1.

1891. 2311. —: Scudder, Bull. U.S. geol. Surv. lxxi. p. 301.

1937. Orthoptère: Piton & Théobald, Rev. Sci. nat. Auvergne (3) ii. p. 9.

*Distribution*.—Lutetian, Middle Eocene: Menat, France.

*Specimen*.—Not traced.

*Remarks*.—Unidentifiable.

Acrididæ, gen. et sp. indet., no. 3.

1937. ? *Ædipoda* Serv.: Théobald, Ins. foss. Terr. olig. France, p. 118.

*Distribution*.—Sannoisian, Lower Oligocene: Célas (Gard), France.

*Specimen*.—Marseilles Museum, no. C 9.

*Parts known*.—Wings with partly preserved venation.

*Measurements*.—Length of wings, 65 mm.

*Remarks*.—Théobald thinks this is an *Ædipodine*.

Acrididæ, gen. et sp. indet., no. 4.

1829. "Une espèce de la taille et du port du *Gryllus cærulescens*": de Serres, Géogn. Terr. tert. p. 226.

1856. Arten vom Habitus der *Æ. cærulescens*: Giebel, Fauna Vorwelt, ii. (1), p. 309.

1890. Aix species mentioned by Serres: Scudder, Rep. U.S. geol. Surv. Terr. xiii. p. 225. (An "*Ædipoda*.")

1891. 2398. *Gryllus* —: Scudder, Bull. U.S. geol. Surv. lxxi. p. 310.

1891. 2436. *Ædipoda* —: Scudder, Bull. U.S. geol. Surv. lxxi. p. 314.

1907. (*Ædipoda*) —: Serres: Handlirsch, Fossile Insekten, p. 687.

*Distribution*. Stampian Middle Oligocene: Aix-en-Provence, France.

*Specimen*. Not traced.

*Remarks*.—No description or figure.

Acrididæ, gen. et sp. indet., no. 5.

1885. *Chimarocephala* sehr nahe: Scudder, in Zittel, Handb. Pal. (i) ii. p. 768.

1886. *Chimarocephala*: Scudder, Bull. U.S. geol. Surv. xxi. p. 49.

1890. Apparently allied to *Chimarocephala*: Scudder, Rep. U.S. geol. Surv. Terr. xiii. p. 224.

1891. 2367. *Chimarocephala* (vic.): Scudder, Bull. U.S. geol. Surv. lxx. p. 306.

1907. (*Chimarocephala*) —: Scudder: Handlirsch, Fossile Insekten, p. 687.

*Distribution*.—Stampian. Middle Oligocene. Aix-en-Provence, France.

*Specimen*.—"In the hands of M. Oustalet."

*Remarks*.—No description.

Acrididæ, gen. et sp. indet., no. 6.

1890. *Leptysma* (or *Arnilia*): Scudder, Rep. U.S. geol. Surv. Terr. xiii. p. 223.

1891. 2418. *Leptysma* (or *Arnilia*): Scudder, Bull. U.S. geol. Surv. lxxi. p. 312.

1891. 2384. *Gomphocerius*: Scudder, Bull. U.S. geol. Surv. lxxi. p. 308.

1907. (*Leptysma*) —: Scudder: Handlirsch, Fossile Insekten, p. 687.

*Distribution*.—Stampian, Middle Oligocene: Aix-en-Provence, France.

*Specimen*.—Not traced.

*Remarks*.—No description.

## \*Acrididæ, gen. et sp. indet., no. 7.

*Distribution*.—Helvetian, Lower Miocene: Radoboj, Croatia.

*Specimen*.—Naturhistorisches Museum, Vienna, no. 1902, iii. 216.

*Parts known*.—Hind leg.

*Remarks*.—A slender leg, not determinable.

## Acrididæ, gen. et sp. indet., no. 8.

1888. *Pachytylus*: Schöberlin, Soc. ent. iii. p. 51. (Partim.)

1891. 2446. *Pachytylus* —: Scudder, Bull. U.S. geol. Surv. lxxi. p. 316.

1891. *Pachytylus*: Scudder, Bull. U.S. geol. Surv. lxxi. p. 316.

1907. (*Pachytylus*) — Schöberlin: Handlirsch, Fossile Insekten, p. 688.

*Distribution*.—Sarmatian, Upper Miocene. Öeningen, Baden, Germany.

*Specimen*. Not traced

*Remarks*. No description. Perhaps identical with Acrididæ, gen. indet. *œningensis* (Heer), p. 16, or with *Heeracris* Zeuner (Ann. & Mag. Nat. Hist. (11) viii. p. 518).

## Acrididæ, gen. et sp. indet., nos. 9–14.

1907. (Acridioidea) 6 species: Handlirsch, Fossile Insekten, p. 688.

*Distribution*.—Upper Miocene: Gabbro, Italy.

*Specimens*.—Coll. von Bosniaski.

*Remarks*.—Not determinable *teste* Handlirsch.

## \*Acrididæ, gen. et sp. indet., no. 15.

\*1931. (92). Kleiner Acridier: Zeuner, Fortschr. Geol. Pal. Berlin (9) xxviii. p. 280.

*Distribution*. Sarmatian, Upper Miocene: Böttingen, Suabian Alb, Württemberg, Germany.

*Specimen*.—Württembergische Naturaliensammlung Stuttgart, Böttingen Coll., no. 92.

*Parts known*.—Portion of body.

*Measurements*.—Thorax 4.5 mm. long, 3 mm. wide.

*Remarks*.—Not determinable.

## \*Acrididæ, gen. et sp. indet., no. 16.

\*1931. (58). Kleiner Acridier: Zeuner, Fortschr. Geol. Pal. Berlin (9) xxviii. p. 280.

*Distribution*.—Sarmatian, Upper Miocene: Böttingen, Suabian Alb, Württemberg, Germany.



*Specimen*.—Württembergische Naturaliensammlung, Stuttgart, Böttingen Coll., no. 58.

*Parts known*.—Thorax and abdomen to seventh segment.

*Measurements*.—Thorax about 3·5 mm. wide, abdomen 23 mm. long.

*Remarks*.—Not determinable.

\*Acrididæ, gen. et sp. indet., no. 17.

\*1931. (42). Sehr kleiner Aoridier (?): Zeuner, Fortschr. Geol. Pal. Berlin (9) xxviii. p. 281.

*Distribution*.—Sarmatian, Upper Miocene: Böttingen, Suabian Alb, Württemberg, Germany.

*Specimen*.—Württembergische Naturaliensammlung, Stuttgart, Böttingen Coll., no. 42.

*Parts known*.—Body, with hind leg.

*Measurements*.—Thorax about 3·2 mm. long, 2·8 mm. wide. Hind femur 5·0 mm. long.

*Remarks*.—Not determinable.

\*Acrididæ, gen. et sp. indet., no. 18.

\*1931. (40). Kleines Aoridiermännchen (?): Zeuner, Fortschr. Geol. Pal. Berlin (9) xxviii. p. 282, pl. xv. fig. 2.

*Distribution*.—Sarmatian, Upper Miocene: Böttingen, Suabian Alb, Württemberg, Germany.

*Specimen*.—Württembergische Naturaliensammlung, Stuttgart, Böttingen Coll., no. 40. (Casts, British Museum (Natural History), In. 38852 (head and thorax). In. 38853 (sternum and abdomen).

*Parts known*.—Complete specimen without wings.

*Measurements*.—18–19 mm. long from head to tip of abdomen.

*Remarks*.—This specimen exhibits several peculiarities and might repay re-examination.

\*Acrididæ, gen. et sp. indet., no. 19.

\*1931. (7). Einzelnes linkes Aoridierbein: Zeuner, Fortschr. Geol. Pal. Berlin (9) xxviii. p. 284, pl. vii. fig. 4.

*Distribution*.—Sarmatian, Upper Miocene: Böttingen, Suabian Alb, Württemberg, Germany.

*Specimen*.—Württembergische Naturaliensammlung, Stuttgart, Böttingen Coll., no. 7.

*Parts known*.—Incomplete hind femur.

*Remarks*.—Not determinable.

## \*Acrididæ, gen. et sp. indet., no. 20.

- \*1931. (8). Einzelnes linksseitiges Acridierbein: Zeuner, *Fortschr. Geol. Pal. Berlin* (9) xxviii. p. 284, pl. vii. fig. 1.

*Distribution*.—Sarmatian, Upper Miocene: Böttingen, Suabian Alb, Württemberg, Germany.

*Specimen*.—Württembergische Naturaliensammlung, Stuttgart, Böttingen Coll., no. 8. Casts, British Museum (Natural History), In. 38854.

*Parts known*.—Incomplete hind femur.

*Remarks*.—Too large for *Protocatantops*, too small for *Miocænacris*, from the same locality.

## \*Acrididæ, gen. et sp. indet.

- \*1934. Kopf und Pronotum von Tryxalmen: Zeuner, *Starunia Krakow*, iii. p. 12.

*Distribution*.—Upper Pleistocene: Starunia, Polish Carpathians.

*Specimens*.—Polish Academy of Sciences, Cracow. Starunia Coll., tubes 20, 23, 24.

*Parts known*.—Remains of heads and bodies.

*Remarks*.—Probably belonging to Acridinæ, but not determinable.

## ADDENDUM TO

## Subfamily CATANTOPINÆ.

(See Ann. & Mag. Nat. Hist. (11) viii. p. 512.)

## Tribe EUTHYMIINI.

- Euthymia Ramme, 1929, Mitt. zool. Mus. Berlin, xv. p. 285; Rehn, 1938, Proc. Acad. Nat. Sci. Philadelphia, ex. p. 41; Uvarov, 1943, Ann. & Mag. Nat. Hist. (11) x. p. 384.

## MECOSTIBUS Karsch.

1896. *Mecostibus* Karsch, Stett. ent. Zg. lvii. p. 260.  
 1929. *Mecostibus* Karsch: Ramme Mitt. zool. Mus. Berlin, xv. p. 293.  
 1930. *Mecostibus*: Burr, Ent. Rec. xl. p. 86.  
 1941. *Mecostibus*: Uvarov, J. E. Afr. Uganda Nat. Hist. Soc. xvi. p. 30.

*Genotype*.—*Mecostibus sublaris* Karsch, 1896.

*Distribution*.—Upper Pleistocene and Recent: East Africa.

*Diagnosis*.—Wingless Euthymiini with short head and broad vertical face, concave meso-metasternum, slender

hind femora with narrow edges outside the fishbone areas, hind tarsi very long (about  $\frac{2}{3}$  or more of the hind femora), and with a conical process on the upper outer side of the middle coxa.

*Remarks.*—This is a genus living on trees and shrubs, to which the species are peculiarly adapted. With their concave sterna they fit closely to the branches, which they resemble in stature and often in surface-texture and coloration. The long hind tarsi are probably used in catching hold of twigs or leaves when jumping.

The cone-shaped processus of the middle coxa was first described by B. P. Uvarov in 1941 (p. 31) of *M. sellatus* Uv.; he has kindly informed me that it is present in all species of the genus.

\**Mecostibus* sp. indet.

*Distribution.*—Upper Pleistocene Copal: East Africa (shipped from Dar-es-Salaam).

*Specimen.*—British Museum (Natural History), In. 25789. Presented by J. R. Morton, Esq., 1925.

*Parts known.*—Complete first-stage male larva, only antennæ missing.

*Measurements.*—

Head—end of abdomen .....	6.3 mm.
Head, length .....	0.8 ..
height .....	c. 2.4 ..
Pronotum, length .....	0.8 ..
width .....	1.3 ..
Hind femur, length .....	3.6 ..
Hind tibia, length .....	3.4 ..
Hind tarsus, length .....	c. 2.4 ..

*Description.*—All generic characters are clearly identifiable, including the mesocoxal cone. Body cylindrical. Pronotum and first few abdominal segments with a faint indication of a ridge. Coloration mottled brown, with two light spots on the distal half of the hind femora. Probably blackish brown in life.

*Remarks.*—This small larva was regarded as unidentifiable until the cracked surface of the copal was polished off. In spite of its small size and youthful stage, the generic characters, including the mesocoxal cone, are unmistakable.

The presence of a *Mecostibus* in upper Pleistocene copal from East Africa throws some light on the origin

of this fossil resin. At least one of the Recent species has actually been found, by Dr. Malcolm Burr, on a species of copal-producing tree. This *Mecostibus* is new and will be described by Dr. B. P. Uvarov; it was collected in north-western Rhodesia on the Mopane Tree (*Copaifera mopane* Kirk.). Actually, the fossil larva could well belong to the new species living on Mopane. A description of the habits of *Mecostibus* on Mopane is contained in Burr's 'Field Notes from Northern Rhodesia' (1930, p. 87).

The Mopane Tree\* is a member of the "bush" which experiences a dry season regularly. In favourable areas (e. g. Mozambique) it grows into a tall tree and forms open forests with bushy or grassy undergrowth. In less favourable areas it is a low tree or high shrub. The related west African species, *Copaifera salicoides* Heckel and *C. demoussi* Harms, which yield the West African Gum Copal and the Cameroon Gum Copal respectively, are high trees forming a story above bushy undergrowth. Both occur in the zone with a pronounced dry season. The tree, which is believed to have produced most of the fossil East African Copal, is *Trachylobium hornemannianum* Hayne, a close relative of *Copaifera*. This is a large tree which occurs in islands in grasslands and scrub, and which does not suffer dense undergrowth. From these indications it may be inferred that the environment from which the fossil copal comes was grasslands and scrub interspersed with areas of high trees of the species mentioned, in a seasonally dry climate. It was not the tropical rain forest, as is often assumed.

The fact that fossil copal is dug in districts of East Africa, where at least *Trachylobium* no longer occurs, suggests a change of climate towards drier conditions, and this may be regarded as justifying the assumption of the upper Pleistocene age of the fossil copal.

#### Conclusion.

This part concludes the survey of the fossil Acrididæ. It is inevitably destructive to a considerable extent, since many original determinations have proved to be erroneous.

\* Dr. A. B. Jackson, of the Department of Botany, has kindly provided me with publications on this and other copal-producing trees.

A number of genera whose presence in Tertiary deposits has hitherto been regarded as certain (*e. g.* *Oedipoda*) have disappeared from the list. In this manner, however, a truer picture of the fossil faunas is obtained, the classification of the fossils is put on an up-to-date basis, and we now know which species may be regarded as trustworthy in phylogenetic work.

Further papers will record the fossil Eumastacidae, Tetrigidae, Eleanidae and Tridactylidae. These will complete the revision of the fossil Acridodea.

**XXXIX.** —*Leeches in the British Museum, mostly Hæmadipsinæ from the South Pacific with Descriptions of New Species.* By J. PERCY MOORE.

[Plate IV]

ALONG with the collection of leeches made by Mr. J. W. Pringle in the Atlas Mts. of Morocco and reported upon in this Journal (Moore, 1939), the late Mr. C. C. A. Monro sent for study and determination several small lots from scattered localities. Among these are three hitherto undescribed species of sanguivorous land leeches and the very interesting albinic and cave-dwelling *Dina absoloni* from Bulgaria. Types and most of the collection have been returned to the British Museum, the authorities of which presented a set of duplicates and paratypes to my collection. The photographs were made by Mr. Herman Walters of the University of Pennsylvania.

BRANCHELLION, sp. ? (Pl. IV, fig. 1.)

The single moderately contracted specimen measures 17 mm. long, 5 mm. wide, including the branchiæ, and 1.8 mm. deep. In general appearance and in most specific characters it resembles the genotype *B. torpedinis* Savigny, as is well shown in the photographs. Among the most striking resemblances are the number (33 prs.) and arrangement of the strongly ruffled branchiæ, the deep hooded form of the contracted cephalic sucker, 3 post-anal annuli, excessively large caudal sucker and general constitution of the somites. There are 16 annuli in the pre-clitellar region (V (a 3 only) to X incl.) of the

neck (trachelosome of Meyer). This agrees with one of the later descriptions of *B. torpedinis* (Harding, 1910), but differs from most of the others, including Sukatschoff (1912), which usually assign 12 to 14 annuli to this region. On two small specimens from Naples I counted 14 distinct annuli in somites VI to X inclusive and the last annulus of V, which is free from the cephalic sucker. This specimen, therefore, appears to have two more annuli than is usual in *B. torpedinis*. Other features which differ from the descriptions of that species are the apparent absence of eyes on the cephalic sucker, conspicuous dorsal biannulation of all of the primary annuli of the middle body region, a ventral fold or half collar on VII *a* 2 and similar folds connecting across the venter the two branchiæ of the 5th and 6th pairs on XIV *a* 3 and XV *a* 1, and probably the colour. As there is only one specimen, and any of these peculiarities might be individual variations or some of them arise from the stresses of preservation, the claim to specific distinctness is waived. Apathy (1888) appears to be the only author who has figured subdivided annuli, in agreement with both of the Naples examples examined by me which exhibit the secondary furrows, but fainter and shallower than on the present specimen. On all leeches strong contraction deepens the furrows by compressing and elevating the annuli, especially if the alimentary canal be empty. The branchiæ are very large, much ruffled on the margins and noticeably inclined toward the venter. They all arise from the cephalic halves of their respective primary annuli, that is, from *b* 1, *b* 3 and *b* 5 of each somite. The pulsatile vesicles on the sensory annuli (*a* 2 of each somite from XIII to XXIII inclusive) while as usual connected with the bases of the 2nd pair (1st pair on XII) of branchiæ of each somite, lie chiefly or entirely on the caudal face of their respective peduncles, occupying the caudal half annulus (*b* 4) and extending little or not at all on to *b* 3 and the cephalic aspect of the gill. This is in marked contrast to all published figures of *Branchellion* with which I am familiar, all of which show the branchiæ arising directly out of the vesicles, which are developed about equally on both cephalic and caudal aspects and the corresponding halves

of the annuli. The condition described, of course, may be accidental or functional, but its uniformity throughout the branchiate region is striking and may be correlated with the strong biannulation of the primary annuli (see fig. 1). The large caudal sucker is abundantly supplied on the ventral face with the curious little mushroom-like papillae or cupules, so characteristic of the genus. They are distributed over the entire surface, but at the centre are fewer, larger and more widely and irregularly spaced. MacDonald (1877) figures just the reverse for his *Branchellion*, the papillae being represented as increasing in size from the centre to the periphery. At about one-quarter of the length of a radius from the centre they are disposed in about 15 irregular radiating lines. In the peripheral direction their number increases by repeated bifurcation and intercalation until at the margin about 108 were counted, the papillae at the same time becoming smaller and more closely spaced. The longer post-median ray contains 19 papillae, the ante-median 10. A rough calculation shows the total number to be about 900. All of these characters show well in the photographs.

"Assumption Isl., J. Hornell, July 10, 1936, from marbled torpedo ray."

The genus *Branchellion* is much in need of critical and comprehensive revision based upon more extensive material and a re-study of all available types. It has been customary, following Blanchard (1894), to refer all examples from European and neighbouring waters to the type species *B. torpedinis* Savigny, and the occasional specimens having 33 pairs of gills that have been reported elsewhere have been likewise so identified. The species is abundant in the Mediterranean, and much has been written about its remarkable structure (see especially Sukatschoof, 1912). Nevertheless, there remain several discrepancies among taxonomic characters described which earlier led to the proposal of several specific names. For example, the number of pairs of gills has been stated variously as 31 to 35, but 33 is the presently established number for the genotype. More recently Leigh-Sharpe (1916, 1933) has described two species definitely having 31 pairs of gills, *B. australis* from South Australia and *B. borealis* from England, the latter probably identical

with *B. ravenelii* (Girard, 1850), a species common along the Atlantic coast of North America, recently adequately redescribed by Meyer (1941).

I know of no published records of the genus as having been taken in the Indian Ocean \*, but Grube (1867) and Baird (1869) have described three nominal species from the South Pacific. *B. imbricatum* (Grube, attributed to the South Seas, is stated definitely to have 32 pairs of gills with entire (unruffled) edges. Blanchard (1892) identified *B. punctulatum* Baird from North Australia with an unnamed Branchellion from Shark Bay, W. Australia, partly described and figured by MacDonald (1877). Baird states that the gills are "simple not puckered" on the margins, but the number is not stated. As the number of body segments, excluding the neck, is given as 32, if correctly counted the number of pairs of gills could hardly have exceeded 29. MacDonald's figure shows the gills as cordiform with smooth margins and numbering 29 (Blanchard states 30). A second species, *B. lineari*, described by Baird and taken by the same collector at King George's Sound, the same place as *B. punctulatum* but on a different host, is indistinguishable in the description from the latter except for its much smaller size and is probably a younger specimen of the same species. *B. intylifolium* Baird (1869) is from an unknown locality, but possibly may be the species here represented or the true *B. torpedinis*. The gills are described as "puckered and sinuated like the leaf of endive," and while their number is not stated, the number and distribution of the annuli would make either 32, 33, or 34 possible. As so many of the descriptions are inadequate, re-study of the types will be necessary for their determination.

#### HEMADIPSA PICTA Moore, 1929.

One full-grown specimen with the typical colour pattern; no well-defined areolæ between eyes 3 and 4; sucker rays 84, prehensile papilla of sucker only moderately prominent.

\* There were none in the Indian Museum in 1930, nor, I have been informed, in the British Museum. At this time it is impossible to extend this search.



"Klang Gates, Federated Malay States, June 1933, N. C. E. Miller."

*HÆMADIPSA SYLVESTRIS* Blanchard, subsp. *INTERRUPTA*  
Moore 1935.

Two small examples with a few areolæ between eyes 3 and 4, with about 70 sucker rays and the prehensile papilla well developed. One has the typical median dorsal series of dark brown spots; on the other these tend to coalesce into a more continuous stripe, approaching more closely the subsp. *sylvestris*. "Sungei Lui, Ulu Langat, F.M.S., Aug. 13, 1933, N. C. E. Miller."

*PHYTOBDELLA LINEATA*, sp. n. (Pl. IV. figs. 2, 3.)

*Diagnosis.* Size medium ( $8 \times 1.8$  to  $19 \times 6.3$  mm.); form as in *P. meyeri*, the genotype. Median areolæ on head rarely present, eyes 4 and 5 usually separated by 2, rarely 3, rows of areolæ. Somites I-IV, XXV-XXVII unianulate, V 2-annulate, VI and XXIV 3-annulate, XXIII 4-annulate, VII (and VIII) 5-annulate, and IX to XXII, inclusive, 6-annulate with the formula  $c\ 1 - c\ 2 < b\ 5 = b\ 6 < b\ 2 = a\ 2$  or  $< a\ 2$ . Gonopores separated most frequently by 5 annuli, ♂ XI/XII, ♀ XII  $b\ 5/b\ 6$ , but may be by 6. Auricles much reduced, bilobate, caudal lobe very small, spine-like. Sucker rays at margin average 75.7 (73-79). Lambert's organ tubular, folded, the gland 8-9 times as long as the duct. Colour pattern longitudinally striped. Type locality, Kakoda, Papua, 1200 ft.

*Description of Type.* The best preserved and one of the largest measures in moderate contraction: length 21.3, to ♂ pore 7; widths, buccal 2.6, ♂ pore 4.8, maximum (XIX, XX) 5.4, anus ca. 4; depths at same points 2.4, 2.5, 3, ca. 1; caudal sucker  $4 \times 4.2$  mm. Form as usual in contracted land leeches, terete at the buccal ring, becoming increasingly moderately depressed to the half-round section of the middle body region. Lip subtriangular, the apical or prostomial rim divided into many granule-like tessellæ, each bearing a labial sense organ. On the dorsum somites I-V divided into very prominent areolæ, the larger metameric ones bearing the eyes and segmental sensillæ, the smaller ones non-segmental sense organs. Eyes 5 pairs, very conspicuous, especially the

first 3, the first 4 pairs on contiguous annuli of somites II to V, the 5th on VI, separated from the 4th by 3 irregular but fairly distinct rows of areolæ representing more or less distinct annuli. Oral opening nearly circular, bounded ventrally and caudally by the deeply furrowed buccal ring formed by the ventral union of IV *a* 3 and V *a* 1, *a* 2; the buccal membrane low and scarcely visible above the buccal ring, its margin slightly crenate and ruffled, with the lateral or nephroporal lobes more prominent. Ventral face of lip granulated with fine tessellæ, mostly in regular rows separated by furrows which converge from the margin of the lip to a point anterior to the dorsal indentation of the velum. Furrow pits may be represented by deeper depressions at the intermediate level of the furrows VII/VIII and VIII/IX. Gonopores conspicuous, separated by 5 annuli, the ♂ at XI/XII, large, surrounded by a slightly raised elliptical glandular ring, the ♀ in the furrow XII *b* 5/*b* 6, a small, simple pore. Nephropores generally open and conspicuous on every somite from IX to XXII inclusive, at about the level of the supramarginal line in the furrow *b* 2/*a* 2, the last or 17th pair below the auricular sinuses, the first pair seen only in sections at the base of the lateral buccal lobes. Auricles small, smooth, bilobate, formed of the marginal flanges of somites XXIV to XXVII, the anterior lobe contributed by 2 annuli, larger, with a small pointed projection enclosing the sinus, the posterior lobe merely a pointed, spine-like process formed by somite XXVII; the sinus circular, puncture-like, lacking a covering middle lobe. Caudal sucker nearly circular with a well-differentiated anterior lobe and prehensile papilla and a depressed central area divided into fairly regular polygonal areolæ from which radiate 56 friction ridges, some of which divide more or less dichotomously to 74 or 75 at the margin, where they end in as many little lobes. Colour almost totally faded but showing some traces of four pairs of dorsal and one pair of ventral submarginal longitudinal dark stripes.

*Somites and Annuli of Type.* Somites I–IV uniannulate. I a pair of preocular paramedians and a single supramarginal areola on one side. II a pair of large paramedians bearing the first pair of eyes and in contact medially, a single posterior, partly intercalated, interocular

and on each side a single supramarginal. Remaining pairs of eyes borne on large polygonal intermediate areolæ, with, in addition, one pair of interoculars on III and 2 pairs on IV, besides supramarginals and marginals at the lateral borders of the lip, and a small area between the 3rd and 4th eyes on the right side. V biannulate, the larger anterior annulus ( $a\ 1, a\ 2$ ) with a pair of large intermediate areolæ bearing eyes 4 and between them two partially separated rows of 7 areolæ each, together with lateral supramarginals continued ventrally by small areolæ uniting with the second annulus ( $a\ 3$ ), which is the first complete annulus and forms the greater part of the buccal ring;  $a\ 3$  resembles succeeding annuli in the number and arrangement of the areolæ. VI 3-annulate, bears 5th pair of eyes on intermediate areolæ of  $a\ 2$ ,  $a\ 1$  and  $a\ 3$  larger than  $a\ 2$ , both showing slight and irregular subdivision into secondary areolæ; on the venter  $a\ 1$  and  $a\ 2$  united in 4 large areolæ in the median field to form the post-buccal ring. VII 5-annulate ( $b\ 1=b\ 2$  slightly  $< b\ 5=b\ 6 < a\ 2$ ), each formed of a single row of prominent, rounded areolæ with no ventral union of annuli as on VI. VIII 5-annulate, like VII, except that  $b\ 1$  has 7 dorsal areolæ divided by cross furrows initiating the separation of  $c\ 1$  and  $c\ 2$ . IX 6-annulate ( $c\ 1-c\ 2 < b\ 5=b\ 6 < b\ 2 < a\ 2$ ), nephropore 2 (first seen) in furrow  $b\ 2/a\ 2$ . X to XXI 6 annulate and complete, like IX, except that frequently  $a\ 2 < b\ 2$ ; all bear nephropores, and the annuli have about 30 dorsal areolæ, usually larger and smaller ones alternating and staggered with those of contiguous annuli; ventral areolæ less well defined and usually 22 to 24. Each areola on the dorsum bears a sense organ or a group of sense organs, and the larger metameric ones on the neural annuli bear sensillæ having the customary arrangement. XIX and XX show some irregularities in the form of split and spiral annuli. The furrow  $b\ 2/a\ 2$  is almost invariably wider open than the others, showing the nephropores clearly. XXII 6-annulate with  $b\ 5$  and  $b\ 6$  somewhat reduced. XXIII 4-annulate ( $b\ 1=b\ 2=a\ 3 < a\ 2$ ), all distinct on venter; last normal nephropore (16) like others. XXIV 3-annulate dorsally but united at margins and ventrally to form one, the last ventral annulus, the marginal flange contributing to the auricles. XXV, XXVI and XXVII each uniannulate on the dorsum, obliterated on the venter

by the crowding forward of the sucker and its peduncle, at the margins combining with XXIV *a* 3 to form the auricles.

*Variations.* Other individuals vary in size from  $8 \times 1.8$  to  $19 \times 6.3$  mm. The arrangement of the cephalic annuli and areolæ differs little from the type except on two specimens, one of which has small extra areolæ split off from the cephalic margin of the outer interoculars of both sides of V, resulting in a partial annulus between the 3rd and 4th eyes, and the other has a series of distinct median areolæ on II, III, IV and V. There is considerable variation in the degree of multiplication of interocular and pre-ocular (intermediate) areolæ of VI *a* 1, in two cases this is so pronounced that one might be justified in describing 3 annuli between eyes 4 and 5. Only on the type specimen were abnormal split and spiral annuli observed on complete somites. On one specimen somite XXIII, normally 4-annulate, has *a* 3 partially subdivided on the right side, making an incipient fifth annulus. Deep slit-like depressions of the furrows VII/VIII and VIII/IX usually occur on each side at the dorsal intermediate level and may be regarded as furrow pits. More important are variations in the position of the gonopores, which may be separated by 5 or 6 annuli; 5 specimens have them situated exactly as in the type; 2 others have them also 5 annuli apart, but the ♂ is at XI *b* 5/*b* 6, the ♀ at XII *a* 2/*b* 5; 3 have the ♂ XI *b* 5/*b* 6, ♀ XII *b* 5/*b* 6, separated by 6 annuli. The number of sucker rays is fairly constant at the margin, varying from 73 to 79 with the average 75.7, and at the centre from 52 to 56. In these specimens the prehensile papilla is contracted and little prominent and seldom even slightly hooked. Natural colours are completely gone, but the colour pattern remains and is more distinct in photographs than to the eye. On the dorsum are four pairs of brown or black stripes, inner and outer paramedian, intermediate and supramarginal; the first two pairs are the widest and densest, the last the faintest, often broken into short lengths or irregular spots, or absent caudally or completely. In the pre-clitellar region the stripes are reduced to two pairs by the union of the two paramedians and of the intermediate and supramarginal of each side. In the head region this process is carried farther by the coalescence of all stripes into a pair

of irregular lateral blotches, leaving a clear median field in which the eyes lie. Other variations are the reduction of all stripes progressively from the caudal end. Occasionally small round pigment spots mark the position of sensillæ on posterior somites. On the venter are a median and a pair of submarginal stripes. The latter are constant but vary in length, continuity and density. The median stripe is more variable, may be continuous for the entire length, limited to a greater or less extent of the anterior end or nearly or quite absent as in the type specimen.

*Anatomy.* The following data are based upon a single dissection and two series of sections. Jaws 2, opposite, right and left, high and narrow, both measurements being about 0.6 mm., the separating sinus about one-half that in depth, the cutting edge a flat curve with the visible teeth confined to the median half. Teeth macerated and mostly lost, but their remnants and the salivary gland ducts indicate about 50 of larger size and possibly 35 diminishing small ones. Gastric cæca are simple sacs with little indication of lobation, the last pair arising in XIX and extending caudal by the sides of the intestine to somite XXIV, where they give rise a little short of the tip to the ducts of Lambert's organ, leaving a small pocket beyond the opening of the duct. Lambert's organ paired, lying on each side between the gastric cæcum and the intestine and extending forward to ganglion XXI. (Glandular part of Lambert's organ tubular and elongated, about 8-9 times as long and three times the diameter of the short narrow duct, but folded into a compact mass which appears to be much shorter. Digestive stomach cordiform with the rounded basal lobes projecting forward. Intestine tubular, without definite paired cæca, but with irregular foldings and enlargements followed by a sharp dorso-ventral S-fold and a large clavate-triangular rectal cæcum attached to the body wall by a pair of muscles arising from its large closed end and which pull it out as a pair of basal angles. Reproductive organs differ in no important respect as seen in contracted specimens from those of *P. catenifera* and *P. maculosa*. Testes 10 pairs. XIII/XIV to XXII/XXIII: epididymis compact and shortened (the mass formed by the much-folded sperm duct), 1.8 mm. in diameter, ejaculatory bulb only slightly differentiated on the prostate horn of the sperm duct and

measures  $1.6 \times 0.2$  mm. The vagina lies on the left side of the nerve cord, the somewhat telescoped sac measures  $2.5 \times 1.5$  mm., the stalk about the same length and 2 mm. in diameter.

"Kakoda, Papua, 1200 ft., May 1, 1933, Miss L. E. Cheesman, no. 117, 1 specimen, no. 156, type and 8 others."

*PHYTOBDELLA MACULOSA*, sp. n. (Pl. IV, figs. 4, 5.)

*Diagnosis.* Size, form and general morphology similar to *P. lineata*. Head areolae, very irregular, medians frequent, eyes 1 and 5 separated by 2 or 3 rows, nearly equally. Somites I to IV and XXV to XXVII unianulate, V, VI and XXIV 3-annulate, VII 4-annulate, XXIII 5-annulate, VIII to XXII incl. 6 annulate, typically  $c\ 1\ c\ 2\ b\ 5\ b\ 6\ b\ 2\ a\ 2$ . Annulation generally more elaborated than in *P. lineata*. Gonopores usually 6 annuli apart, ♂ XI  $b\ 5/b\ 6$ , ♀ XII  $b\ 5/b\ 6$  but variable. Auricles very small, bilobate, the median lobe obsolete. Sucker rays at periphery average 66 (61-69). Lambert's organ tubular as in *P. lineata* but relatively larger. Colour pattern remotely spotted on dorsum, venter plain.

*Type locality.* Mafulu, Papua, 4000 ft.

*Description of Type.* Contracted measures in mm.: length 14.5, to ♂ pore 4.1; widths, buccal 1.9, ♂ pore 4.3 maximum (XXI) 5.3, anus 2.2; depths at same points 1.9, 2.1, 2.5, 1.5, caudal sucker 3.3-2. Elongated ovate in outline with greatest width for caudad, rather strongly depressed for a land leech except near the head where it is terete. Prostomial margin very short, granulated. Eyes 5 pairs as usual, on annuli 2, 3, 4, 5 and 9 (or 8) (somites II to VI), although annuli 5 and 6 (V  $a\ 1, a\ 2$ ) are not distinct at the intermediate level of the eyes but only in the median-paramedian field; on the ventral face of the lip the median labial furrow is much deeper than the lateral furrows which separate the converging rows of granules. No furrow pits distinguished. Gonopores separated by 6 annuli, the ♂ in the furrow XI  $b\ 5/b\ 6$ , ♀ XII  $b\ 5/b\ 6$ , both rather large and deep in the furrows. Nephropores conspicuous in  $b\ 2/a\ 2$  furrows in the supra-marginal level from IX to XXIII inclusive, the first pair, which should be carried forward from VIII to the sides of the buccal annulus, as in *P. lineata*, not seen, the last

pair (17th) extended from somite XXIV by the nephridial ducts to open deep beneath the sinus of the auricles. Auricles small, bilobate, the median lobe absent, anterior and posterior lobes both small, pointed, thin and translucent, nearly surrounding the circular puncture-like sinus. A narrow depressed line for nearly the entire length of the dorsal surface. Caudal sucker broadly ovate with a short but pointed and hooked prehensile process; radial ridges 49 at the central end, 69 at the periphery. Colour faded to a nearly uniform yellowish brown background marked on the dorsum with small, round, blackish spots mostly confined to the larger areolæ, most numerous at the cephalic end and becoming gradually fewer caudad; no ventral stripes or other markings.

*Somites and Annuli.* Prostomial margin of lip a short ring not separated from somite I by a definite furrow but composed of two irregular rows of minute granule-like tessellæ like those of the ventral surface of the lip, each bearing a labial sense organ. I uniannulate, consisting of a single median and a pair of preocular paramedian areolæ each bearing a sensilla. II uniannulate, a single small median, a pair of large paramedians bearing the first pair of eyes and a pair of supramarginals apparently with sensillæ. III uniannulate, areolæ irregular, a pair of large intermediates bearing the second pair of eyes, laterad of which are small supramarginals and mediad a pair of small interoculars apparently without sensillæ; on the right side, a large paramedian bearing a sensilla, partly separating the interoculars from the right intermediate but largely lying within the limits of IV; left paramedian in normal position but divided by a transverse furrow into 2 tandem areolæ. IV uniannulate, large intermediate oculars bearing eyes 3 in contact with those of III and V, laterad on each side a single supramarginal and on the right side partly between the paramedian and the intermediate ocular is the area described under III; a small unpaired median and a small left paramedian separated from the left intermediate by a narrow areola. V 3-annulate ( $a_1 = a_2 > a_3$ );  $a_1$  and  $a_2$  distinct in the median-paramedian field between the large intermediate oculars bearing eyes 4 and each consisting of 8 or 9 areolæ of irregular size and shape, mostly alternately larger and smaller, staggered and interlocking on the two annuli;

small supramarginals contribute to the formation of the buccal ring. VI 3-annulate bearing the 5th pair of eyes on  $a\ 2$ ;  $a\ 1$  and  $a\ 2$  each slightly shorter than  $a\ 3$ , the furrow  $a\ 1/a\ 2$  shallower than  $a\ 2/a\ 3$  and distinct all around except at the ocular areolæ and for a short distance in the median ventral field, where they are united with  $V\ a\ 3$  also. They are constituted of alternating large and small areolæ staggered on the 2 annuli and the intermediate ocular pair are enlarged and extend over both annuli;  $a\ 3$  is a complete ring distinct all around. VII 4-annulate,  $a\ 1 > a\ 2 > b\ 5 = b\ 6$ ;  $b\ 5$  and  $b\ 6$  are more closely united especially on the venter, where together they are scarcely larger than  $a\ 1$ . VIII 6-annulate,  $c\ 1 = c\ 2 < b\ 2 = a\ 2 = b\ 5 = b\ 6$  approximately. IX to XXI similar to VIII, but  $b\ 5 = b\ 6 < b\ 2 < a\ 2$  is generally the relative size of these 4 annuli. The 3-1-2 arrangement of the annuli is seen best on the venter, but the strong contraction disarranges the annuli on many segments and on the dorsum the appearance is often deceptive of a 2-2-2 division of the primary annuli. XXII 6-annulate on the dorsum with  $c\ 1$ ,  $c\ 2$  and  $b\ 5$ ,  $b\ 6$  both reduced and less differentiated on the venter, where a 3-annulate condition is approached. XXIII 5-annulate with  $c\ 1$ ,  $c\ 2$  much reduced and  $b\ 5$ ,  $b\ 6$  reduced in size and separated only in spots. XXIV 3-annulate,  $a\ 1$  and  $a\ 2$  partly united and  $a\ 3$  completely distinct and contributing to the auricles. XXV, XXVI and XXVII each uniannulate and their marginal flanges, except the latter, completing the auricles. Annuli of complete somites constituted of about 32 areolæ on the dorsal half and about the same number on the ventral half. They differ greatly in size, being usually alternately large and small and staggered on contiguous annuli, a condition emphasized by the strong contraction of the specimens. The larger ones, at least, bear small sensory papillæ and those on  $a\ 2$ , which bear the segmental papillæ, are much the largest. Sensillæ are arranged as usual in the Hæmadipsinæ, the dorsal intermediates being the most conspicuous.

*Variations.* Among the 11 specimens considerable variation occurs. Extremes in size are  $10 \times 3 \times ca.\ 1.8$  and  $19.5 \times 6 \times 2.9$  mm. The position of maximum width varies slightly with the condition of the specimen, especially the degree of distension of the cæca with blood, but is



normally at XX or XXI, which because of the reduction of the caudal somites makes it appear farther back than in most leeches. The buccal region is terete, the post-clitellar generally half-round, although the degree of depression differs with the stomach content and state of contraction. The head may be broadly rounded or bluntly pointed. The buccal membrane and lateral lobes are generally higher and more prominent than in *P. lineata*. First pair of nephropores were invisible in surface views of all individuals, but the remaining 16 pairs are situated exactly as in the type. Areolæ of the cephalic end are usually low and rounded like pebbles, but on one specimen are elevated and pointed caudally, giving somewhat the appearance of the overlapping scales of a pine cone but in the reverse direction. The irregularity of transverse rows is sometimes so great that uncertainty arises as to which of two annuli a particular area may belong. Somite I usually consists of 4 areolæ bearing the paramedian and intermediate sensillæ, but on 2 examples there are only 3. Median areolæ are frequent on the head somites, in some cases being divided into 2, tandemwise. Particularly is there variation in the region between the annuli bearing the 4th and 5th eyes, that is V a 2 and VI a 2. On the type and 5 others there are 2 rows of areolæ representing V a 3 and VI a 1; on 4 there are 3 more or less complete and irregular rows, the additional one apparently arising by the division of VI a 1 into b 1 and b 2; on one there are 3 rows on the left, 2 on the right side. One specimen farther departs from the normal in having V biannulate and VIII 5-annulate. So-called furrow pits are evident on the smallest specimen only, being slit-like depressions at about the level of the intermediate line in the furrows IX b 5/b 6 and X b 5/b 6 and smaller ones in VIII b 5/b 6. The position of the gonopores also varies, the normal, as found on the type and 5 others, having the ♂ at XI b 5/b 6, the ♀ at XII b 5/b 6, that is 6 annuli apart; 2 have the ♂ in XI b 6, and 3 in the furrow XI/XII or only and 5½ and 5 annuli anterior to the ♀ which remains constant in position on all 11 specimens. The position of the nephropores is invariable and all but the first pair are easily found, and the position of many of the middle 15 is indicated by a small black spot. The number of

sucker rays as counted at the periphery varies from 61 to 69, the average being 66.1; at the central ends where they abut against the granulated central area they number 15-20 less and consequently dichotomize less than in some species of land leeches. Auricles appear to vary only in slight differences in size and pointing of the lobes. All specimens have the colours faded and altered, but while the small black spots on the dorsum are often obscure, they are discernible on all but one. On the venter no markings whatever appear. The median dorsal depressed line appears on all specimens and may be continuous for the entire length or fade out more or less completely in places.

*Anatomy.* The internal anatomy as known from a single dissection of a strongly contracted specimen differs in no important respect from that of *P. lineata* and *P. catenifera*. In size and form the jaws are exactly like *P. lineata*, but on the specimens examined the teeth are completely destroyed. As in *P. lineata*, Lambert's organ is elongated with a short duct and much folded, but somewhat spindle-shaped gland, being slightly enlarged toward the middle and tapered both ways, turned forward from the opening of its duct near the end of the last gastric cæcum in XXIV to the 9th pair of testes sacs in XXI; the duct measures 0.5 mm. long and less than 0.1 mm. in diameter, the unfolded gland about  $3.5 \times 0.3$  mm. Testes sacs 10 pairs, the last terminating the vas deferens very small, alternating with the gastric cæca at XIII/XIV to XXII/XXIII. Vasa deferentia as usual, becoming enlarged in XIII cephalad of the first pair of testes to form the epididymi, which are large intricately folded masses in contact on the dorsal side of the nerve cord, extending through XII and partly into XI and XIII, the ectal limb with the wider duct about twice as long as the ental or posterior limb, the duct in both intricately and closely folded. Ejaculatory bulb and duct which continue the ectal limb well differentiated, the former (seminal vesicle) measuring  $2 \times 1.5$  mm. Male atrium small, entirely subneural, so that its horns or ejaculatory ducts are quite symmetrical, its dorsal face covered with tufts of prostate glands which envelope the horns also. Female organs very large. Ovisacs spheroidal, on the body floor at XII/XIII, paired oviducts very short, the

left slightly longer and passing beneath the nerve cord, uniting with the right duct on the right side to form the common oviduct, which is about 3 times as long (2 mm.) as the paired and slightly wider, no obvious albumen gland at their junction; it takes a slightly winding course from the level of the nerve cord on the right side at the cephalic end of somite XIII to empty into the dorsal face of the enlarged end of the vaginal sac just above the origin of the vaginal stalk. Vagina on right side of nerve cord ventrad of the stomach, extending from the ♀ pore to the caudal end of XVI and if straightened would reach much farther; the stalk tubular, opening into wide anterior end of bulb, with several folds,  $3.6 \times 0.3$  mm. in length and diameter; the sac subconical or ovoidal with the large end forward, and measures  $3.8 \times 1.6$  mm.

"Mafulu, Papua, 4000 ft., Dec. 1931. Miss L. E. Cheeseman." No. 520, type and 8 others; no. 581, 2.

*Remarks on the Somite of Phytobdella.* The composition of the sex-annulate somite of this genus has proved puzzling. Usually it has been regarded as formed by the subdivision of the neural annulus of the quinquannulate somite, making six in all. This was the view adopted in my description of *P. catenifera* (Moore, 1938) when the complete somite was interpreted as constituted of all six secondary annuli with the formula  $b\ 1-6$ . On contracted specimens the annuli frequently are grouped in twos in agreement with this interpretation. Subsequently I studied some well-extended and well-preserved specimens of *P. meyeri* Bl. collected by Dr. L. L. Gardner in the Philippine Islands. These presented a picture entirely different from contracted specimens previously studied. Clearly the annuli differ in length and the furrows in depth. In each group of 6 annuli, the sensillæ are borne on the largest; the next largest is the annulus next preceding this and bearing the nephropores on its caudal margin. The two preceding this which are grouped together are the shortest and the two following the neural annulus and similarly grouped are intermediate in size. In the typical quinquannulate somite of most bloodsucking leeches the sensillæ are always on the third annulus ( $a\ 2$ ) and the nephropores on the caudal margin of the second. Correlating these facts with the relative depth of the

interannular furrows and the metameric features of the colour pattern externally and with the position of the nerve ganglia, distribution of the nerve trunks, and the position of the gastric cæca, testes sacs, dorso-ventral muscle sheets and other metameric features internally, it seemed clear that the second primary or neural annulus is undivided and the following formula was arrived at :  $c\ 1 = c\ 2 < b\ 5 = b\ 6 < b\ 2 < a\ 2$ , which means that the first primary annulus ( $a\ 1$ ) is divided into one secondary ( $b\ 2$ ) and two tertiary ( $c\ 1$ ,  $c\ 2$ ) and the third primary ( $a\ 3$ ) into two secondary annuli ( $b\ 5$ ,  $b\ 6$ ), while the second primary ( $a\ 2$ ) persists undivided.

With this determination in mind *P. catenifera* was re-examined and compared with the two species described herein. In spite of the strongly contracted state of all of this material, which tends to obscure and efface the external proportions by compression and deep folding of the annuli, and the internal metamerism by the crowding and displacement of organs, it was found that the same conditions so evident in extended specimens of *P. meyeri* could be recognized in these also and that the best interpretation of the complete somite is expressed in the above formula. On the ventral surface it frequently happens that the first annulus ( $c\ 1$ ) is drawn deeply into the preceding intersegmental furrow so that it almost disappears in the middle field, but marginally and dorsally its close association with  $c\ 2$  is nearly always evident. On the other hand, on the dorsum  $b\ 2$  and  $a\ 2$  are often drawn together in an apparent third pair which is particularly what misled me in the original description of *P. catenifera*. Also in leeches of the family Hirudidae and to a nearly equal degree in other families when the number of annuli in a somite exceeds 5 it is almost invariably the caudal end and not the cephalic in which the increase takes place. To this *Phytobdella* proves to be an exception.

*CHTONOBDELLA PARVA*, sp. n. (Pl. IV. fig. 6.)

*Diagnosis.* Holotype small,  $7 \times 2$  mm. Eyes 4 and 5 separated by 2 annuli. No evident furrow pits. Gonopores separated by 3 annuli, the ♂ XI  $b\ 2/a\ 2$ , ♀ XI/XII. Auricles vestigial, without free lobes. Sucker rays at periphery about 80, central granulated area about one-half

diameter of sucker. Somites I-IV and XXV-XXVII uniannulate, V biannulate, VI 3-annulate, VII and XXIV 4-annulate, VIII to XXIII 5-annulate. Annuli of middle body region of larger papillate areolæ alternating with smaller ones divided transversely into two tandem parts. Jaws 2. Colour and anatomy unknown. Type locality W. Santo, New Hebrides, 4000 ft.

*Descriptions of holotype.* The only specimen measures contracted  $7 \times 2 \times 1.6$ , caudal sucker 1.6 mm. Form short, thick, subterete, more depressed caudally, like any contracted typical hæmidipsine. Lip broad and the entire cephalic sucker and mouth wide open, exposing the jaws through the velar orifice. No median ventral furrow, but the whole wedge-shaped median field smooth and bounded laterally by a pair of shallow furrows. Buccal membrane and lateral lobes little developed. Eyes 5 pairs, large and conspicuous, especially the first three, arranged as usual in an arch on somites II to VI, the first 4 pairs on contiguous annuli, the 5th separated from the 4th by 2 annuli (V a 3 and VI a 1). Gonopores separated by 3 annuli, ♂ XI b 2/a 2, ♀ XI/XII, both rather large but simple orifices deep in the furrows. No nephropores and no sensillæ could be distinguished with certainty. Auricles greatly reduced, practically vestigial, simply a pair of low smooth, undivided folds formed by the conjoined margins of somites XXV, XXVI and XXVII. Annuli of middle region divided dorsally into about 14 large areolæ, each bearing a rather prominent whitish papilla alternating with smaller areolæ without papillæ often divided into two tandem-wise by a transverse furrow. The prominence of the papillæ is probably due to strong contraction. Sensillæ indistinguishable. Caudal sucker as wide as body, nearly circular, with the prehensile papilla small and infolded; sucker rays about 80 at the periphery, less numerous centrad, where they are much broken, thereby extending the granulated central area farther than usual. Colour completely faded to a nearly uniform grey but more dusky in the dorsal cephalic region.

*Somites and annuli.* Because of small size and translucency areolæ are difficult to analyse on the head. Prostomium and I, besides the marginal granulations only one pair of areolæ (paramedian) bearing sensillæ

appear in front of the eyes. II-IV each uniannulate. II, a pair of paramedians bearing the first pair of eyes and a small post-ocular sense papilla, no other areolæ distinguishable. III, one small median, a pair of paramedians, a pair of intermediates bearing the 2nd pair of eyes and a pair of marginals. IV, 1 median, 2 pairs of interocular paramedians, a pair of large intermediate oculars bearing the third pair of eyes and probably 2 pairs of marginals or marginals and supramarginals. V biannulate ( $a_1, a_2 > a_3$ ), the large first annulus consists of 3 or 4 irregular interoculars on each side, a pair of large intermediate oculars bearing the 4th eyes, and several small marginals entering into the buccal ring;  $a_3$  is a nearly complete annulus composed of 12-14 dorsal areolæ each bearing a small sense organ, and ventrally forming most of the buccal ring. VI 3-annulate dorsally ( $a_1 = a_2 = a_3$ ), the 5th eyes on the intermediate areolæ of  $a_2$ ;  $a_1$  and  $a_2$  each divided into about 14 dorsal areolæ, each bearing a prominent sensory papilla among which the sensillæ cannot be distinguished; united ventrally to form the post-buccal ring.  $a_3$  a complete annulus both dorsally and ventrally similar to those following. VII 4-annulate dorsally ( $a_1 = a_2 > b_5 = b_6$ ), the latter two undifferentiated ventrally where the formula is  $a_1 = a_2 < a_3$ . VIII 5-annulate all around ( $b_1 = b_2 = b_5 = b_6 < a_2$ ). IX-XXIII 5-annulate and complete with all annuli approximately equal or  $a_2$  slightly longer. XXIV 4-annulate by the reduction and coalescence of  $b_5$  and  $b_6$ . XXV, XXVI and XXVII uniannulate.

Nothing is known of the anatomy except that the jaws as seen through the separated dorsal and ventral folds of the velum are two, paired right and left exactly as figured by Harding (1913) for his *Ideobdella*. They are prominent but relatively small, 0.18 mm. along the dentinal ridge. The right one examined under a higher magnification appears to be perfectly smooth, the teeth all lost by the separation of the cuticle, but the structure of the dentinal ridge indicates that they were relatively few and coarse.

The unique specimen was taken by Dr. J. R. Baker, of the Oxford University New Hebrides Exp. at Tatarii, W. Santo, 4000 ft., Nov. 1933.

If *Ideobdella* Harding is really generically distinct from *Chtonobdella* Grube, this species probably should be

referred to the former, with which it agrees in the practically obsolete auricles. Harding failed to find Lambert's organ, so well developed in *Chtonobdella*, and also places the first pair of nephropores on somite VII, which is unique. Until specimens of *C. parva* are available for anatomical study and more is known of *Ideobdella* a final decision must be withheld.

#### CHTONOBDELLA LIMBATA Grube, 1866.

*Geobdella (limbata)* Whitman, 1886.

*Geobdella whitmani et australensis* Lambert, 1899.

*Hæmadipsa limbata* Blanchard, 1917.

The single poorly preserved and partly engorged but moderately extended individual measures: length 36, to ♂ pore 7.5; widths, buccal ring 1.7, ♂ pore 3.5, maximum (XX) 5.2, anus 3.5; depths at same points 1.6, 2.5, 5.1, ca. 2; sucker 4.4 × 5 mm. Gonopores separated by  $7\frac{1}{2}$  annuli, the ♂ at XI *b* 5/*b* 6, the ♀ XIII *b* 2. Nephropores clearly seen slightly above the marginal line at the caudal border of *b* 2 of many somites. Auricles small but distinct and trilobate, formed by the lateral margins of XXV, XXVI and XXVII; middle lobe smallest, merely a pointed process directed outward in the sinus between the 1st and 3rd lobes, both of which are rounded, with a pointed process directed toward the median lobe. Caudal sucker oval, distinctly longer than wide, the anterior margin pointed and provided with a small, slightly hooked prehensile papilla; rays 64. Somites I-IV, XXV-XXVII uniannulate, V and XXIV biannulate, VI 3-annulate dorsally, 2 ventrally, VII 3-annulate all around, VIII and XXIII 4-annulate, IX-XXII 5-annulate, complete. Colours faded but the pattern preserved. Ground-colour buff, the dorsum with a narrow median clear yellow line, on each side of which is a broad paramedian field, thickly and irregularly mottled and clouded with black, which is much denser at the margins of the fields, to form distinct inner paramedian and intermediate stripes. There are also similar black supramarginal stripes and yellowish marginal stripes. On the venter there are traces of less differentiated black mottling.

"Darringo, New South Wales, W. Heron, Esq."

The two specimens attributed to New Zealand, U.S. Exploring Expedition, referred to by me (1898) in the

collection of the U.S. National Museum must be labelled incorrectly, as the Wilkes Expedition did not visit New Zealand, and this species has not been reported therefrom. See Benham, 1903, p. 186, footnote.

#### DINA ABSOLONI Johansson.

*Dina absoloni* Johansson, 1913, p. 80.

Several specimens of this interesting cave-dwelling leech were collected by Miss D. Aubertin in subterranean waters in Dalmatia. Although previously reported under other names Johansson was the first to correctly describe and allocate this species. While recognizing the close similarity to *Dina lineata* (O. F. Müller), Johansson found a very constant difference in the position of the male gonopore which in *D. absoloni* is situated constantly between the first and second annuli of somite X (his notation), while in all of the hundreds of *D. lineata* examined by him it is invariably between the second and third annuli of the same somite. Blindness and depigmentation are adaptations to darkness, very generally characterizing cavernicolous animals and consequently have ecological rather than systematic significance.

Ten well-extended specimens, somewhat shrunken by partial drying, measure from  $19 \times 2$  to  $29 \times 4.7$  mm. All of the larger ones have well-developed clitellia extending over fifteen annuli from X b 5 to XIII a 2 inclusive. The ♂ pore is usually large and in all cases in the furrow XII b 1/b 2 (my notation), as stated by Johansson, on the summit of a prominent fluted conical papilla surrounded by a circle of small lobules. The ♀ pore is a very minute orifice, difficult to see, but in all four individuals in which it was certainly determined, at XII b 5/b 6, three annuli caudad of the ♂ pore. The annulation was not studied in detail, but on all complete somites the fifth annulus (b 6) is definitely enlarged and subdivided by a shallow furrow into the tertiary annuli c 11 and c 12, and the third or neural annulus (a 2) is slightly larger than b 1, b 2 or b 5 and shows a faint b 3/b 4 furrow. Although there are numerous minute sensory papillae arranged in transverse rows on all annuli, there are no large elevated papillae, and no sensillae were detected. A dissection of one mature specimen shows that the pharynx



is of the strepsilæmatous type, with three muscular ridges having a 60° twist, without stylets or denticles at the cephalic end and extending caudally to ganglion XIV, where an annular valve separates it from the mid-gut. The atrium is of the typical *Erpobdella* type with the cornu directed forward and continued by preatrial loops of the vasa deferentia as far as ganglion XI. Taken with the absence of pigment and the habitat the agreement of these specimens with Johansson's account is complete.

"Bjelusica Cave, Papovopoljè, Zavala, Dalmatia, May 28, 1934, Miss D. Aubertin." 10 specimens.

Miss Aubertin kindly furnished the following additional information. "The leeches were collected in a small underground stream inside the cave where there was no trace of light. When collected they were quite white but I cannot remember whether the eyes showed or not. However, they were certainly white."

I have studied examples of *Dina lineata* from Morocco and its subspecies *concolor* Annandale from Palestine, which agree with Johansson's account of the position of the male pore and confirm his opinion that *D. blasei* Blanchard is a synonym of *D. lineata* (Müller). This makes the latter the type of the genus. The preceding description shows that *D. absoloni* is very close to *D. lineata*, for aside from the purely adaptive depigmentation the only character in which they differ is in the position of the male pore, which is variable in many other species of Erpobdellidæ. The reproductive organs so far as known agree with those of *D. lineata* and differ from several species of American leeches which hitherto have been referred to *Dina*. While Johansson is herein followed in separating *D. absoloni* specifically from *D. lineata*, it seems probable that it is a derivative of the latter through a genetic variation in the position of the ♂ pore and the acquisition of the darkness response of depigmentation.

So far as I know *Dina absoloni* is the only true cave leech that has been reported. It seems to be fairly common and generally distributed in the caves of the Balkans and has not been recorded as a surface dweller. The first actually recorded discovery was by Mrázek, who in 1902 found it in the Quelle Voda Radujerina at Njegus and other subterranean waters in Montenegro. He reported it in 1908 as a cave-dwelling variety of *Dina*

*quadristriata* Grube, but later (1914) states that his specimens are identical with Johansson's species. The material upon which Johansson's description was based was collected by Dr. Absolon in Vjeternica cave in Popovopoljè and in the underground stream Ponipve at Turkovitsh at the lower end of the former in Herzegowina, Jugoslavia. Wolf (1938) also refers to a record for the Rekahöhlen at Trieste which I have not consulted. All authors who have examined these leeches agree on the absence of pigment. Absolon (1913) states that in life they are pink. This colour is due to the blood in superficial vessels and is commonly seen in other leeches in which pigment is deficient either generally or locally, and especially in the young before pigment develops. Johansson in referring to the eyelessness of *D. absoloni* cautiously limits his statement to the absence of the pigment cups; Mrázek (1914), who studied both living leeches and sections, seems to go further and asserts that the eyes are totally absent, although the visual cells are not specifically mentioned. In a single series of sections made from one of Miss Aubertin's specimens a few visual cells are clearly recognizable in the position of the pair of labial eyes of *D. lineata*. They are shrunk and appear to be degenerated, but it is possible that this appearance may be due to faulty preservation. No visual cells were observed in the position of the buccal eyes. It would be interesting if some zoologist to whom these leeches are accessible would test their sensory reactions. The visual cells referred to, and possibly scattered ones not detected in my sections may be phototactic even in the absence of screening pigment. There is no known evidence that in substitution for visual deficiency these leeches have developed super-sensitive tactile organs. In the sections such organs appear no better developed than in surface living leeches.

Although *D. absoloni* is the only known leech so strikingly exhibiting the depigmentation and blindness characteristic of its cave-dwelling associates, these features are exhibited in varying degrees by many leeches not inhabitants of caves. Many burrowing leeches, as the species of *Liostomum*, *Lumbricobdella*, et al lack true eyes and either largely or completely lack pigment, the living colour of red or orange being due to the blood. Many

fish leeches (Piscicolidae), especially those that live in the gill chamber, lack either eyes or pigment or both. In these cases the deficiencies are correlated with the dark habitat. Those living on the exterior of fishes are usually more or less heavily pigmented and eye-like organs vary greatly from none or one pair often poorly developed, to many pairs complete with pigment cups, which may occur at the caudal as well as the cephalic end. Even among leeches living in shallow fresh waters pigment is often meagre and true eyes sometime lacking. The former is true of nearly all young leeches and of some of the small species of Erpobdellidae (*Dina*) and Glossiphonidae in which degree of pigmentation may vary with the physiological condition or the degree of exposure to light. The latter is illustrated by the well-pigmented *Dina anoculata* of California and by at least one species of *Helobdella* and the entire genus of *Anoculobdella* among American Glossiphonids.

It is, of course, well known that leeches of all kinds are cryptozoic in habit and negatively phototropic in reaction, especially after feeding. Consequently they seek concealment in dark places. Many of both sanguivorous and predacious leeches wander about in search of food at night or on dark rainy days when the danger of desiccation is minimized. Some of them burrow into the earth in quest of earthworms, insect larvæ, etc. upon which they prey. The three species *Hæmopsis sanguisuga*, *Erpobdella octoculata* and *Trochæla subviridis* which have been reported from the caves of Europe (Wolf, 1938), the former especially in great numbers, are all of this type and could easily find their way into caves through fissures or by way of underground streams. Individually they probably are not definitive cave-dwellers, nor have any modifications from surface-dwelling individuals been reported. While it is quite probable that leeches of wandering habit such as our American species of *Hæmopsis* may enter caves I know of no cases having been reported, nor does Mr. Charles Mohr, one of our best authorities on cave life.

It is surprising that fish leeches (Piscicolidae) have not been reported from caves more frequently, as cave-dwelling fishes, salamanders and crustaceans would serve as hosts, and other fishes normally inhabiting surface

streams are known to pass by means of underground streams to and from caves. Doubtless other cases are reported in the literature of spelaeology but I know of only three. Spandl (1926) reported *Piscicola geometra* from Turkish Metehia, Herzegowina, and 1 *Illinobdella* (*Piscicola*) *platense* (Cordero) from San Bulha Cave, Motul, Yucatan, and *Cystobranchus* sp. ? from several cenotes in Yucatan (Moore, 1936, 1938). Doubtless all of these are temporary inhabitants of the cave waters along with their hosts as all are known from surface streams also.

Several species of common surface living leeches have been reported among the fauna of city water pipes in Europe. Several are listed by Spandl (1926). The daily newspapers in the United States occasionally mention leeches among the animals that appear in water drawn from city faucets. Large individuals would seldom be able to pass the valves and faucet openings. Among these are small examples of *Macrobdella decora*, *Hæmopsis marmoratis*, *Erpobdella punctata*, *Dina* sp. and *Glossiphonia complanata*. All of these and other species live commonly in the lakes and streams of supply and in suitable reservoirs and find easy access to the water mains, but of recent years, owing to the much wider use of sand filters in addition to subsidence reservoirs the complaints are noticeably fewer.

**LIOSTOMUM COCCINEUM** Wagler, 1831. (Pl. IV. fig. 7.)

*Cycticobdella coccinea* Kennel, 1887.

The single specimen is well preserved, extended and measures: length 49, to ♂ pore 4.2; widths, buccal 1.3, ♂ pore 3, maximum at beginning of caudal third 3.6, anus 2.2; depths at same points 1, 2.6, 3, 2.3 mm. It agrees exactly in almost every external respect with Kennel's excellent description. Sense organs were observed on the margins of the lip and in the marginal fields of anterior annuli to somite VIII but not elsewhere. Nephropores were seen as minute inconspicuous orifices on the caudal borders in the submarginal line of somites XIV to XXIII inclusive, the last being the 10th annulus anterior to the anus. Doubtless they occur anterior to XIV but were undetected.

**Annulation.** Annuli are strongly marked by deep, smooth furrows, and those of the middle body region are angulated by a prominent transverse ridge. All smooth, without papillæ or wrinkles. Prostomium and somites I-III forming the greater part of the lip not visibly separated into annuli but separated from IV by a shallow furrow. IV 2-annulate, the first slightly larger. V, 2-annulate, sharply separated from IV by a furrow that is especially deep at the margins and extends on to the ventral face of the lip; the annuli are equal; the first bounds the mouth above, the second forms the buccal ring and lateral buccal lobes. VI 2-annulate ( $a\ 1, a\ 2$ ), slightly  $>a\ 3$  faintly subdivided and forming the post-buccal ring;  $a\ 3$  complete and distinct all round. VII 3-annulate,  $a\ 2$  slightly  $<a\ 1$  much  $<a\ 3$ . VIII 4-annulate,  $a\ 2$  slightly  $<b\ 5=b\ 6<a\ 1$ . IX 5-annulate, all nearly equal but  $a\ 2$  slightly larger than  $b\ 1$  and  $b\ 2$  and slightly smaller than  $b\ 5$  and  $b\ 6$ . X-XXIV 5-annulate, all practically equal or  $a\ 2$  slightly larger; angulation of annuli begins on X and becomes more prominent on succeeding somites. ♂ pore XII  $b\ 1/b\ 2$ , ♀ XII  $b\ 5$ . XXV 3-annulate,  $a\ 1<a\ 2<a\ 3$ . XXVI 2-annulate ( $a\ 1, a\ 2$ )  $>a\ 3$ , faint,  $a\ 1/a\ 2$ . XXVII 2-annulate,  $a\ 3$  much smaller. Anus XXVI/XXVII.

"British Guiana Expedition, Upper Guyuni River, British Guiana, July 10, 1933, Dr. G. S. Carter. From forest near camp." 1 spec.

The question whether Wagler's (1931) name *Liostoma*(um) is to be applied to *Centropygos* (Grube, 1859), or to the totally different *Hæmenteria* de Filippi (1849) seems clearly to be decided in favour of the former.

The colour, form of body and head, size of mouth, smoothness of skin and other external features and the simple gut described by Wagler apply to leeches of the *Centropygos* and not the *Hæmenteria* type. There appears to have been no doubt about this until Blanchard discovered in the Berlin Museum a leech labelled *Liostoma coccineum* Wagler received from the Munich Museum, and in the latter the designated type and a cotype of the same species. All three were found to be representatives of *Hæmenteria* (*officinalis* et *Mexicana*) de Filippi, 1849 (Blanchard, 1899, p. 183), which Blanchard therefore made a synonym of *Liostomum* Wagler.

The problem is whether the description or the labelled types should determine, as they are completely at variance. In the absence of any known proof to the contrary, it seems most probable either that the labels were at some time misplaced, or that originally the specimens were inadvertently mislabelled. Pinto has discussed and reversed Blanchard's conclusion, but I have not seen his original paper (1920), only a reference to his conclusions in his monograph (1923), with which Autrum (1936) agrees. Two characters mentioned by Wagler do not apply to normal specimens of *Centropygos*: (1) the flattened, trough-like form of the body posteriorly, and (2) the round papillæ on the dorsum. The former could arise from crushing and the latter as a result of shrinkage and the formation of wrinkles during preservation.

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## EXPLANATION OF PLATE IV.

(All were photographed under water on black background.)

- Fig. 1. *Branchellion* sp., dorsal, ventral and lateral views,  $\times 4$ .
- Figs. 2, 3. *Phytobdella lineata*, sp. n., dorsal and ventral views of type, and of one of the cotypes,  $\times 3\frac{1}{2}$ .
- Figs. 4, 5. *Phytobdella maculosa*, sp. n., dorsal and ventral views of the type and the smallest specimen,  $\times 3$ .
- Fig. 6. *Ohtonobdella parva*, sp. nov., dorsal and ventral views of holotype,  $\times 3$ .
- Fig. 7. *Lioctomum coccineum* Wagler, ventral view of a well-extended specimen,  $\times 3\frac{1}{2}$ .

XL.—*New Species of African Acolastus (Cryptocéphalinæ, Col.)*. By G. E. BRYANT, F.R.E.S., Imperial Institute of Entomology.

I now describe nine new species of *Acolastus*. Five of these have been collected by Mr. R. E. Turner in S. and S.W. Africa. The majority of the species have, up to the present, been described from S. Africa, but with more detailed collecting the genus will probably be found to occur all over Africa, as we have one from Senegal and another from Kenya. The species *A. nigroplagiatus* Jac., sinks to *A. simonsi* Baly, and it is probable that both these sink to *A. pictus* Suff., but not having seen Suffrian's type it is impossible to be certain, and as Suffrian's types were in Münster, it is highly probable that they cease to exist. Jacoby also thought that his *A. tuberculatus* Jac. was very close to *A. malvæ* Suff. All these species of *Acolastus* have a very matt appearance, and are extremely difficult to describe, without figuring them, as many have the pattern on the elytra with irregular raised patches and tubercles and varying degrees of pubescence. The types of the new species are in the British Museum, Natural History Department.

*Acolastus albohirsutus*, sp. n. Mossel Bay, S. Africa.

*Acolastus albopictus*, sp. n. Aus, S.W. Africa.

*Acolastus callosus* Gerst. Ak. Wiss. Berl. 1855, p. 636. Mozambique.

*Acolastus capensis*, sp. n. Table Mt., S. Africa.

*Acolastus carinatus*, sp. n. Turkana Province, Kenya.

*Acolastus dunbrodiensis*, sp. n. Dunbrody, S. Africa.

*Acolastus leopardus*, sp. n. Ceres, S. Africa.

*Acolastus malvæ* Suff., Linn. Ent. xi. 1857, p. 246. S. Africa.

*Acolastus ornatipennis*, sp. n. Okahandanja, S.W. Africa.

*Acolastus pictus* Suff., Linn. Ent. xi. 1857, p. 241. S. Africa.

*Acolastus retusus* Suff., Linn. Ent. xi. 1857, p. 244. S. Africa.

*Acolastus senegalensis*, sp. n. Bambey, Senegal.



*Acolastus simonsi* Baly., Trans. Ent. Soc. Lond. 1871, p. 229. Nyassa.

(=*nigroplagiatus* Jac.), Proc. Zool. Soc. Lond. 1898, p. 224. Natal.

*Acolastus tuberculatus* Jac., Proc. Zool. Soc. Lond. 1898, p. 225. Mashonaland.

*Acolastus turneri*, sp. n. Cape Province.

*Acolastus ornatipennis*, sp. n. (Fig. 1.)

Below piceous clothed with white pubescence, head black, with two flavous spots, prothorax flavous, with a fulvous inverted W-shaped pattern. Elytra rugose, ivory-white, each with six black maculæ, with irregular smooth white raised patches.

Length 4 mm.

♂♀.—Head black, closely punctured, with two flavous spots between the eyes, the clypeus, labrum and mandibles flavous, clothed with fine but not dense white pubescence. Antennæ extending to the base of the prothorax, the five basal segments fulvous, the remainder fuscous. Prothorax transverse, flavous, with an inverted fulvous W-shaped marking on the basal two-thirds, strongly but irregularly punctured. Scutellum triangular, black, clothed with fine white pubescence. Elytra ivory-white, with six irregular black maculæ on each, one at the shoulder, one just before the middle, two behind the middle and two near the apex, a smooth irregular raised patch near the middle, strongly and irregularly punctured, the punctures on the apical half forming more regular striae. Legs flavous. Underside piceous, clothed with dense long fine white pubescence, the apical ventral segment of the abdomen margined with flavous. ♀ differs in having the elytral maculæ fulvous and not black.

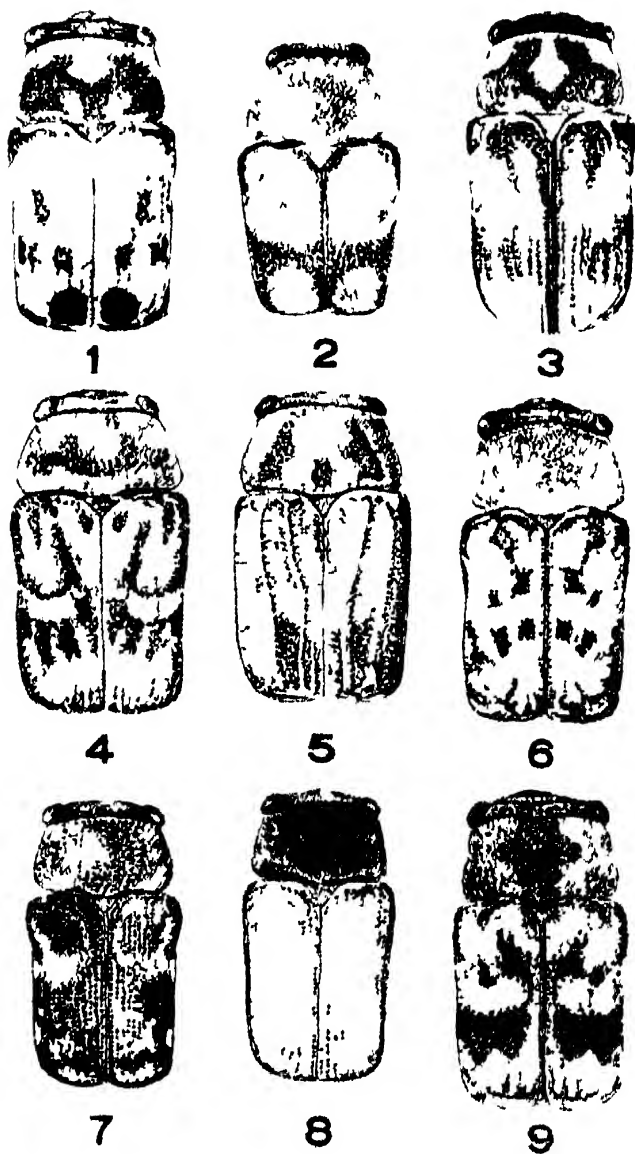
S.W. AFRICA: Okahandja, 27. i.—2. ii. 1928 (*R. E. Turner*), 4 specimens.

Belongs to the group without pubescence on the prothorax and elytra.

*Acolastus senegalensis*, sp. n. (Fig. 2.)

Below fuscous, clothed with dense white pubescence, above fulvous, the head with basal half black, labrum flavous, prothorax fulvous, with the centre black, elytra

Figs. 1-9.



1. *Acolastus ornatipennis*, sp. n.
2. *A. senegalensis*, sp. n.
3. *A. capensis*, sp. n.
4. *A. dunbrodiensis*, sp. n.
5. *A. carinatus*, sp. n.

6. *A. leopardus*, sp. n.
7. *A. albopictus*, sp. n.
8. *A. turneri*, sp. n.
9. *A. albohirsutus*, sp. n.

fulvous, with the shoulders and a transverse band before the apex black.

Length 3.5 mm.

Head with the basal half strongly punctured, the clypeus fulvous and the labrum flavous, clothed with long white not very dense hairs. Antennæ fulvous. Prothorax transverse, fulvous, the central portion black, strongly and evenly punctured, clothed with white adpressed hairs, which are more dense at the sides and base, the sides rounded and slightly contracted in front. Scutellum black, clothed with dense white adpressed hairs. Elytra with the sides tapering slightly to the apex, the basal margin in shape of a transverse ridge, fulvous, with the margins of the scutellum black, the shoulders black, and a transverse black band before the apex, closely and regularly punctured, and clothed with white scattered pubescence. Legs fulvous. Underside piceous, clothed with dense and shorter white pubescence, the first ventral segment of the abdomen the longest.

SENEGAL: Bambey, 28. vii. 1943 (*J. Risbec*), 1 specimen. Baly Collection, British Museum, 1 specimen, without locality.

A very distinct species, the elytra without traces of rugosities and the sides less parallel. Belongs to the group entirely pubescent.

*Acolastus capensis*, sp. n. (Fig. 3.)

Below fuscous, clothed with dense white pubescence, head black, with the labrum fulvous, prothorax fulvous, with an irregular M-shaped black marking; elytra pale brown, with the shoulders and the sutural margin black, and a vague transverse black marking behind the middle, and a flavous irregular raised patch behind the middle.

Length 3 mm.

Head black, the basal half strongly and evenly punctured, clothed with fine scattered white pubescence, the labrum fulvous. Antennæ slender, extending slightly beyond the base of the prothorax, the five basal segments fulvous, the remainder black. Prothorax transverse, fulvous, with an irregular M-shaped black pattern not quite extending to the anterior margin, strongly but not closely punctured, clothed with long fine white pubescence,

which is denser along the basal margin. Scutellum large and triangular, black, clothed with fine white pubescence. Elytra elongate, the sides parallel and rounded at the apex, pale brown, the margin strongly raised, flavous and impunctate, the shoulders and sutural margin black, the basal half of the suture more broadly black, a somewhat vague transverse broken black band before the apex, a smooth flavous raised patch behind the middle on each, strongly and irregularly punctured, the basal half with the punctures very irregular, the apical portion being punctate-striate. Legs flavous, the tarsi tinged with fuscous. Underside fuscous, clothed with dense adpressed white pubescence.

CAPE PROVINCE: Table Mountain, 1906 (*W. Bevins*), 2 specimens. Belongs to the group without pubescence on the elytra.

*Acolastus dunbrodiensis*, sp. n. (Fig. 4.)

Below fuscous, clothed with fine white pubescence, head black, with two fulvous spots, prothorax fulvous, with a transverse black waved band, elytra fulvous, with a black pattern and a curved cream-coloured transverse band behind the middle, and many small cream-coloured scattered tubercles.

Length 3.5-4 mm.

♂♀.—Of matt appearance, head black, with two fulvous patches between the eyes, the labrum and mandibles flavous, finely and closely punctured, and clothed with scattered white pubescence. Antennæ short, extending just beyond the base of the prothorax, fulvous, the apical segments tinged with fuscous, the two basal segments dilated and rounded, the remainder elongate and about equal to each other. Prothorax transverse, fulvous, with a black transverse waved band placed slightly behind the middle, evenly punctured, and clothed with whitish pubescence, which is thicker at the sides and base. Scutellum fulvous, with the basal half black and strongly punctured, triangular. Elytra with the sides parallel, rounded at the apex, fulvous, with black broken longitudinal striæ, a transverse cream-coloured band behind the middle, and many small tubercles and strong irregular punctures. Legs flavous, with the basal two-thirds of the femora fuscous, and the tibiæ with the median portion

fuscous. Underside fulvous, clothed with short fine white pubescence. The ♂ differs in being larger and the upper surface more grey than fulvous.

E. CAPE PROVINCE: Dunbrody, x. 1903 (*J. O'Neil*), 7 specimens. Belongs to the group without pubescence on the elytra.

*Acolastus carinatus*, sp. n. (Fig. 5.)

Almost entirely flavous, with the head darker, prothorax with three fulvous markings, a median spot on the basal margin, and a longitudinal fulvous patch on each side, elytra with the shoulders and a patch near the apex tinged with fulvous, and two pale longitudinal carinæ on each.

Length 3 mm.

Head fulvous, closely and evenly punctured, the labrum flavous, the frontal half clothed with fine adpressed white pubescence. Antennæ slender, flavous, extending slightly beyond the base of the prothorax, the two basal segments more dilated. Prothorax transverse, the sides slightly contracted in front, strongly punctured along the anterior and basal margins, the punctures stronger and not so close together, pale flavous, with three fulvous markings, a round median fulvous patch on the basal margin, and a longitudinal slanting fulvous patch on each side, not touching the anterior margin. Scutellum triangular, fulvous, punctured and clothed with fine white pubescence. Elytra with the sides slightly tapering to the apex and thence rounded, flavous, with faint fulvous markings on the shoulders and a patch on each before the apex, strongly and irregularly punctured, each with two longitudinal wavy carinæ and two raised pale patches at the apex. Legs flavous. Underside flavous, entirely clothed with fine pale adpressed pubescence.

KENYA: Turkana Province, Lodwar, 17. ix. 1934; L. Rudolf Rift Valley Expedition, 1934, 2 specimens.

A very distinct species on account of the carinate elytra, no other species having this character, and belongs to the group without pubescence on the prothorax or elytra.

*Acolastus leopardus*, sp. n. (Fig. 6.)

Below black, clothed with white pubescence, head black, with the mandibles flavous, prothorax black, with the anterior margin flavous, elytra flavous, with irregular

black spots and flavous tubercles and deep irregular punctures.

Length 3.5 mm. (♂)-4 mm. (♀)

♂♀.—Head black, finely and irregularly punctured, clothed with scattered white pubescence, the labrum with a median longitudinal flavous line and the mandibles flavous. Prothorax transverse, black, with the anterior margin narrowly flavous, closely and finely punctured, clothed with long white pubescence, which is more dense at the sides and base. Scutellum black, triangular, clothed with white pubescence. Elytra flavous, with nine irregular black patches on each, the basal margin strongly raised, impunctate, with a black spot in the middle, each with many flavous small tubercles and large deep irregular punctures. Legs with the femora black and pubescent, the tibiae fulvous and tarsi fuscous. Underside black, clothed with long white dense pubescence. Larger than ♂.

CAPE PROVINCE: Ceres, 1500 ft., xii. 1920 (*R. E. Turner*), 5 specimens.

Belongs to the group with head and prothorax pubescent. A very distinct species on account of its black spots and pale tubercles.

*Acolastus albopictus*, sp. n. (Fig. 7.)

Entirely black, except for the creamy-white pattern on the elytra formed by creamy-white tubercles, head and prothorax strongly punctured, clothed with long white adpressed not dense pubescence, the underside with dense pubescence.

Length 2 mm.

♂.—Head black, clothed with fine white pubescence, which is denser on the anterior half, strongly punctured. Antennæ black, extending slightly beyond the base of the prothorax, the two basal segments more dilated, the first about equal to the second and third together. Prothorax transverse, with the sides slightly contracted in front, black, strongly punctured, clothed with long fine white adpressed pubescence, which is denser at the sides and base. Scutellum triangular, black, punctured, pubescent. Elytra with the sides almost parallel, slightly contracted behind the shoulders and rounded at the apex, black, very strongly punctured, with creamy-white

tubercles forming an irregular transverse band before the middle, a triangular-shaped patch before the apex on each and a transverse tuberculate pale patch along the apical margin, and several single irregular tubercles on the basal half. Underside black, feebly punctured, clothed with dense white pubescence, the first ventral segment of the abdomen the longest.

S.W. AFRICA: Aus, 8-30, xi. 1929 (*R. E. Turner*), 1 specimen.

Belongs to the group without pubescence on the elytra. Somewhat allied to *A. albohirsutus* Bry., but much smaller, more tuberculate and the pattern on the elytra less elaborate.

*Acolastus turneri*, sp. n. (Fig. 8.)

Below black, clothed with dense white pubescence, head, prothorax and scutellum black, clothed with scattered white pubescence; elytra dirty ivory-white, with very strong dark punctures. Legs fulvous, with the femora darker.

Length 3.5 mm.

Head black, finely punctured, clothed with scattered white pubescence, the labrum and mandibles flavous, eyes prominent. Antennæ fulvous, with all the segments more or less tinged with fuscous, the two first segments more swollen and rounded, the third shorter and narrower than the fourth. Prothorax transverse black, punctured, clothed with long fine white pubescence, the pubescence thicker at the sides and base. Scutellum triangular, black, clothed with fine white pubescence. Elytra elongate, of a dirty ivory-white colour, the shoulders black, the basal margin transversely raised and impunctate, the remainder covered with strong black punctures, the basal half being confused, the apical half formed in more-or-less regular striae, a strong carina running parallel with the side-margin. Legs fulvous, with the upper portion of the femora dark and clothed with fine white pubescence. Underside black, clothed with long dense white pubescence.

S. AFRICA: Cape Province, Matjesfontein, 19-31, xii. 1928 (*R. E. Turner*), 1 specimen.

This is a very distinct species on account of the elytra having no pattern, and having no tubercles or raised irregular small pale patches, the elytra without pubescence.

*Acolastus albohirsutus*, sp. n. (Fig. 9.)

Greyish black, head with the labrum and mandibles flavous, closely punctured, and clothed with fine white pubescence, prothorax closely punctured, the margins narrowly fulvous, the sides and base with fine white pubescence; elytra greyish black covered with white tubercles and smooth raised pale patches forming a pattern, deeply and closely punctured.

Length 3-4 mm.

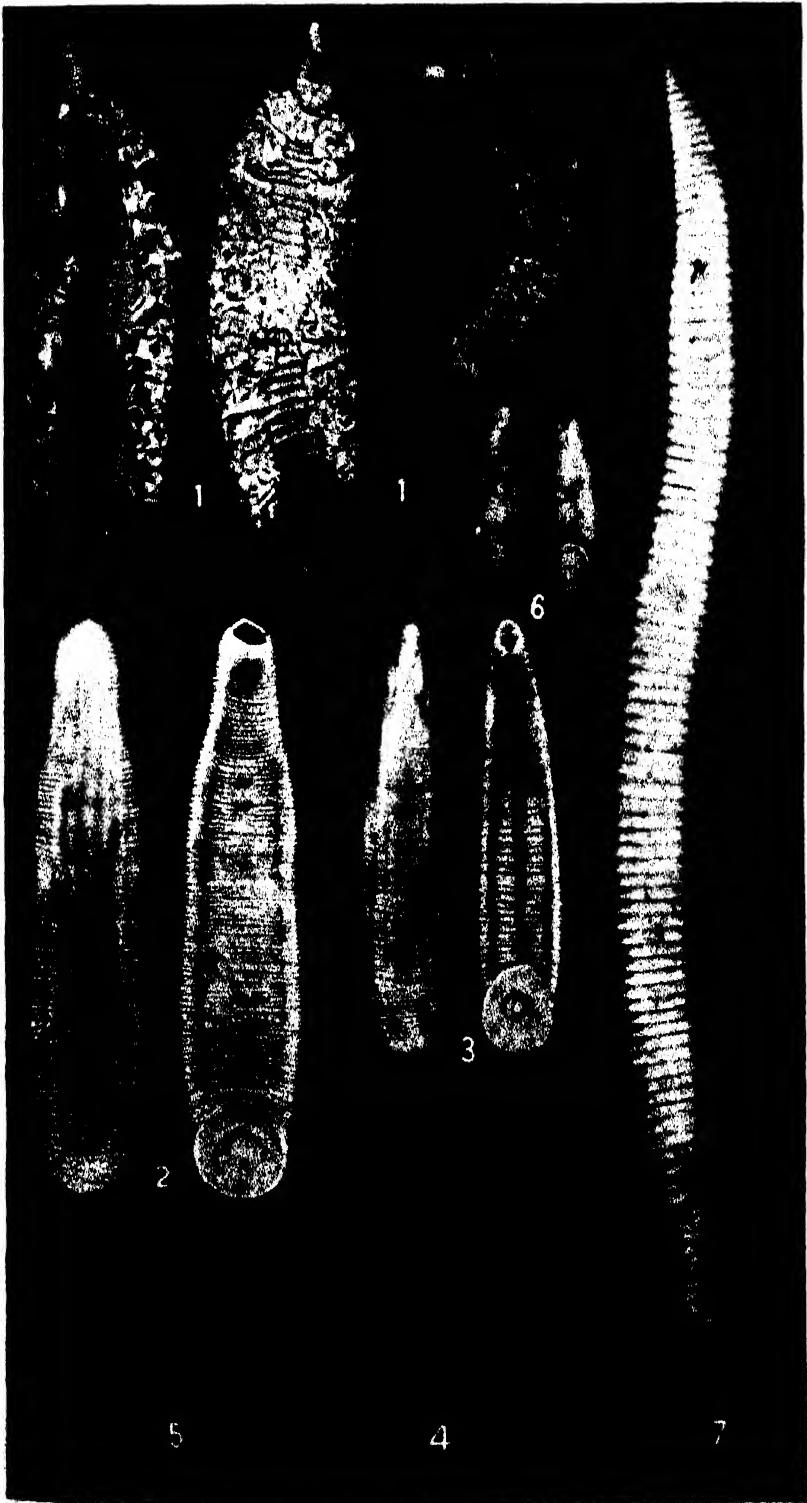
♂. Head black, the eyes prominent, grey-black, with the labrum and mandibles flavous, closely punctured, clothed with fine, not very dense, pubescence. Antennae short, extending to the base of the prothorax, the segments two to five fulvous, the remainder black, the first segment very dilated, the second short and rounded, half as long as the first, the third to the apical all long and slender, about equal to each other. Prothorax transverse, the sides slightly contracted before the middle, greyish black, with all the margins very narrowly fulvous, the sides and base clothed with dense white pubescence, the median portion more or less bare, forming a dark patch in the form of a cross, the surface densely punctured. Scutellum triangular, clothed with white pubescence. Elytra with the sides parallel and rounded at the apex, grey-black, the basal margin raised and smooth, the remainder covered with deep dark punctures and many irregular white tubercles, which form two irregular transverse pale bands, one at the middle and another before the apex. On the basal portion there are two oblique dark patches near the suture, and the shoulders are dark. Legs more or less fulvous, the femora with the median portion fuscous. Underside grey-black, clothed with dense white adpressed pubescence.

S. AFRICA: Mossel Bay, s. 1921 (*R. E. Turner*), 15 specimens (*Holotype*); Ceres, 1-12, xi. 1924 (*R. E. Turner*), 2 specimens; Worcester, ix. 1928 (*R. E. Turner*), 2 specimens.

S.W. AFRICA: Okahanja, 12. iii. 1928 (*R. E. Turner*), 2 specimens; Aus, xii. 1929 (*R. E. Turner*), 15 specimens.

Allied to *A. dunbrodiensis* Bry., but differs in its darker colour, in the pattern on the prothorax and elytra, and the dense white pubescence.







# THE ANNALS AND MAGAZINE OF NATURAL HISTORY.

[ELEVENTH SERIES.]

No. 79. JULY 1944.

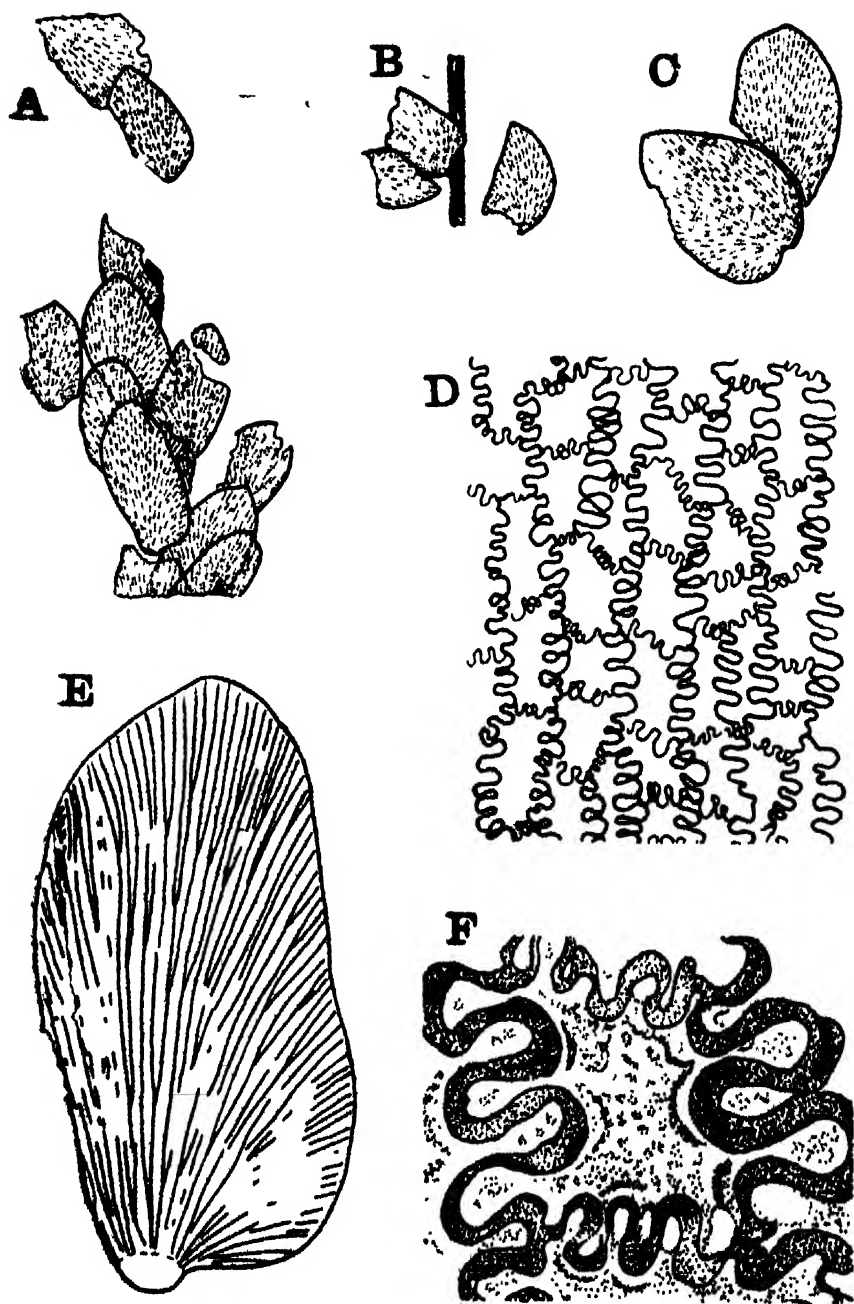
XLI.—*Notes on the Jurassic Flora of Yorkshire*, 10-12.  
By TOM M. HARRIS, University of Reading.

## 10. *Otozamites beani* (L. & H.) Brongn. (Figs. 1, 2.)

1832. *Cylopteris Beani* Lindley and Hutton, pl. xlv. (Good leaves.)  
1849. *Otozamites Beani* Brongniart, p. 106 (Name.)  
1864. *Otopteris mediana* Leckenby, p. 78, pl. x. fig. 2. (Good leaf.)  
1864. *Otopteris Beani* Leckenby, p. 78. (Name only.)  
1875. *Otopteris Beani* Phillips, p. 220, lign. 45. (Poor figure, probably redrawn from Lindley and Hutton.)  
1875. *Otozamites Beani* Saporta, p. 128, pl. xxv. fig. 2. (Figure of good leaf from Yorkshire.)  
1900. *Otozamites Beani* Seward, p. 207, pl. i. figs. 3, 4, pl. ii. fig. 3. (Description, good figures.)

Some excellent leaves of *O. beani* have been figured and its gross form is well known, but the veins have been only roughly sketched and the cuticle was unknown. The present material, consisting of three small and rather battered leaf-fragments, provides these details, but adds nothing to the gross form. The fragments match portions of these better specimens fully but resemble no other Yorkshire species, so that their identification is certain. They were collected from the Gristhorpe Bed, the type-locality of this species, by Mr. F. M. Wonnacott. Their age is Middle Estuarine (Bajocian).

Fig. 1.



*Otozamites Beani* (L. & H.) Brongn.

A, B, C, fragments of leaves Nos. V. 26878, V. 26880, V. 26879. The stippling represents the direction of veins, but not individual veins; in A, which is drawn from above, overlapped parts are indicated by broken lines. All  $\times 1$ . D, upper cuticle, V. 26879,  $\times 200$ . E, one pinna from A,  $\times 4$ . F, one cell of upper cuticle, V. 26879,  $\times 800$ .

*Description.*—The three leaf-fragments figured appear to belong as follows :—In fig. 1 A, to the middle ; B, to the upper and C, to the lower parts of typical leaves. In A, the pinnæ are strongly imbricate. The substance of the pinnæ and rachis is fairly thick, but it is, however, rather brittle. The crowded veins are seen distinctly in all specimens and fork to maintain a concentration of 40–50 per cm.

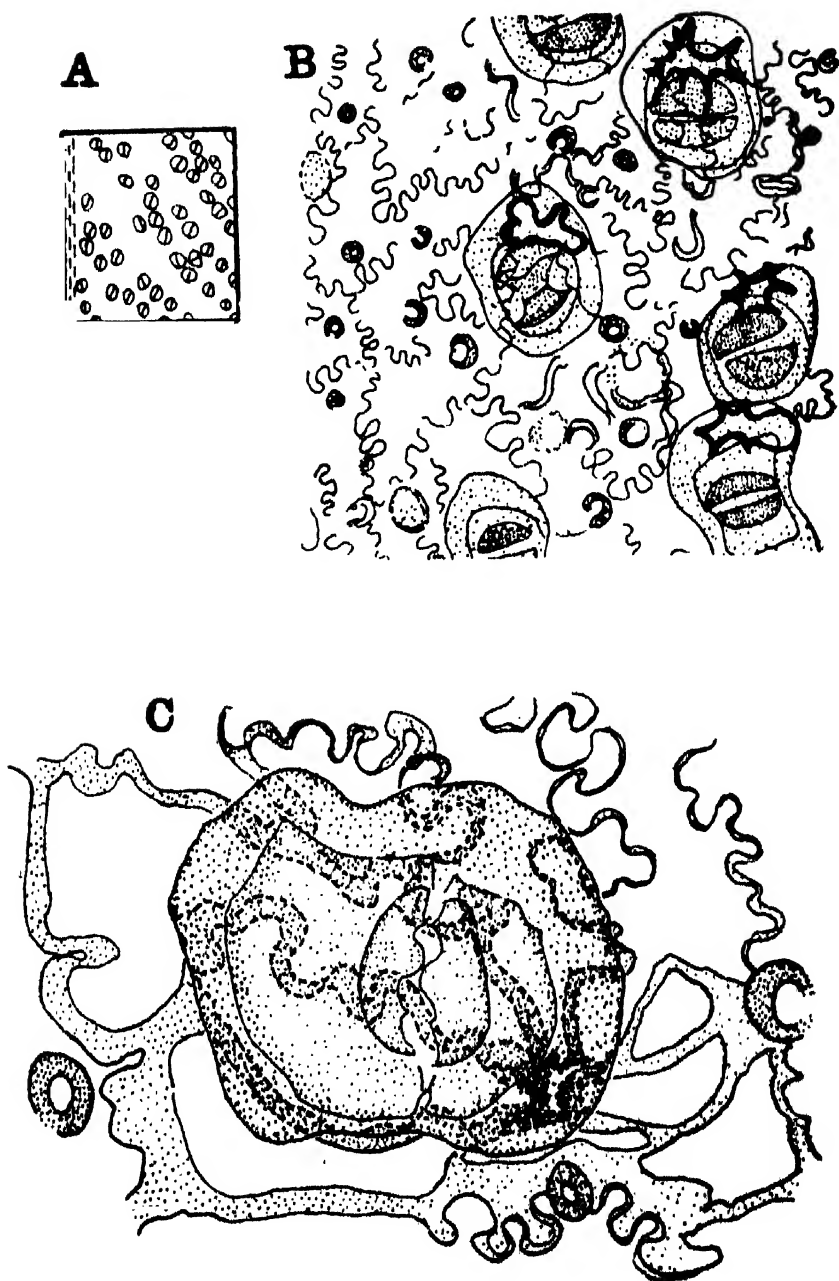
The upper surface of the lamina is the one exposed by splitting, the under needs to be freed from matrix with HF. The upper shows the veins as slight depressions ; between the veins the lamina is sometimes obscurely marked by transverse ridges, due no doubt to the mesophyll. The epidermal cells are scarcely visible. The lower surface shows the veins flush with the surface, but distinguished by the narrower and more regularly placed cells. The epidermal papillæ are very conspicuous on nearly every cell, including those of the margin, but no hairs were seen.

The cuticle is rather thin, the upper about  $1\mu$ , the under rather thinner ; both sides, but particularly the upper, are very friable and often disfigured by matter from the interior of the lamina, and sometimes also marked with cavities caused by corrosion and replacement of the cuticle by small polygonal crystals or by crystal masses of iron pyrites.

The upper cuticle shows uniform cells (fig. 1, D, F) ; the course of the veins is scarcely distinguished. The walls of the cells are strongly folded, the lateral walls being much more conspicuous and coarsely folded than the end walls. The cell-surface is sometimes almost covered by extensions of the wall-folds or is obscurely mottled with marks which often run parallel with the nearest fold ; median papillæ do not occur.

The lower cuticle shows strips between the veins with stomata and equally wide strips along the veins with none. The epidermal cells are of rectangular shape along the veins, irregular between them. The walls are inconspicuous and very sinuous. The surface is mottled with many minute lumps and, in addition, there is a very thickly cutinized but hollow median papillæ on every cell except some of those near stomata.

Fig. 2.

*Otozamites Beani* (L. & H.) Brongn.

A, one sq. mm. of the lower surface showing the stomata; the aperture is shown by a line. The margin is on the left. B, lower cuticle, the cells on the left are above a vein,  $\times 200$ . C, a stoma from within,  $\times 800$ . All from V. 26878.

Trichomes were not seen, but scattered cells with a thickened surface occur which may possibly represent the bases of detached hairs. The stomata are spaced irregularly in the stomatal bands, but tend to form two or three longitudinal rows. The aperture is almost constantly transverse to the veins except near the margin of the pinna, with which it tends to be parallel.

The guard-cells and subsidiary cells are fairly small and both are deeply sunken at the bottom of a very large oval cutinized pit. This pit has a constricted aperture of very irregular shape formed by ingrowths of about six epidermal cells, which seem to lack median papillæ unless these are represented by the projections round the opening of this pit. The opening of this pit seems to be almost flush with the general surface; the cells forming the pit have not been fully made out, but some appear to be of normal size while others are small and have thick straight walls. A peculiar feature is that the opening of the pit is usually not immediately above the guard-cell aperture, but is nearer the main rachis.

*Comparison.*—It is not at present possible to compare *O. beani* fully, but it is distinguished from most species of this large genus by its very short, obtuse pinnæ.

Cuticles of seven other species have been described and show a very interesting range of structure, though all are Bennettitalean. *O. graphicus*, *O. feistmanteli* (see Thomas and Bancroft, 1913), *O. ribeiroanus*, *O. cf. mandelslohi* (see Thomas, 1930), have superficial stomata. *O. bornholmiensis* (see Florin, 1933) has somewhat sunken guard-cells but the subsidiary cells reach the surface and the opening of the pit is wide. *O. pterophylloides* (see Florin, 1931, p. 510) and *O. beani* described here have deeply sunken stomata and subsidiary cells and the mouth of the pit is constricted. *O. sp. indet.* (Florin, 1933) has still more deeply sunken stomata, but the pit is rather differently formed. The cuticle of *O. pterophylloides* agrees also in the epidermal papillæ with *O. beani*, which, however, are lacking in the other species mentioned above. There is thus every reason to consider that the cuticle will provide diagnostic features for distinguishing other species; it may moreover provide the best basis for classifying them into subgeneric groups, which are needed in the taxonomy of this large genus.

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11. *Allicospermum retimirum*, sp. nov.

(Fig. 3.)

There were about thirty specimens of this small seed in the Edwards and Wonnacott Collections, and most of these occurred on two blocks of shale. One block provided scattered but intact "stones" of the seeds; the other provided two groups of neatly cracked half-stones. One of these groups comprises 13 and the other 15 half-stones. There is no organic connection between the members of the groups and it is imagined that some animal might have cracked the seeds and discarded the half-stones in groups.

Many of these specimens proved unsuited to maceration as the coaly substance cracks owing to hygroscopic swelling and shrinking, and all specimens broke up on maceration. The usual method of maceration, however, gave fairly full information about the cutinized membranes, and a modified method showed the structure of the lignified stone.

*Allicospermum* is one of several genera established (Harris, 1935, p. 121) in attempt to classify Mesozoic seeds showing cuticle structure. The chief among its



generic characters are that it is orthotropous, has a well cutinized integument, a partly or entirely free nucellus which is more thinly cutinized, and a well cutinized megaspore membrane. Many living gymnosperms (*Ginkgo*, Cycads, certain Conifers) as well as numerous fossil gymnosperms have seeds of this type, and there is no suggestion that the species at present included form a natural group. The present material is worthy of description if only because it makes a definite species; it is to be hoped that further work will relate it to its parent plant.

*A. retemirum* has no structural feature indicating any affinity, and its associates indicate nothing: there are only the commonest leaves of the Gristhorpe Bed.

*Diagnosis.*—Seed integument consisting of an outer flesh and an inner stone. Stone in compressed state ovate or almost circular but with a small projecting micropyle 0.5 mm. long; seed originally slightly flattened. Length of stone typically 3.5 mm., width 3.0 mm. Surface of stone either almost smooth, or showing low bulging areas of indefinite size but rather longer than broad. Margins of stone distinctly thicker in substance than middle region. Intercellular spaces between stone-cells occupied by resistant material remaining as a delicate network after the substance of the stone has been dissolved in maceration. Hilum a rounded or oval scar 0.7 mm. wide at the base of the seed.

Cuticle of epidermis of integument moderately thick, showing cells about  $60\ \mu$  long  $\times$   $22\ \mu$  broad, with obscurely marked lateral walls and a slightly thickened area occupying the interior, walls becoming conspicuous near the micropyle. Stone of integument composed of about twelve layers of thick-walled, pitted stone-cells. Micropylar canal lined by narrow cells. Inner cuticle of integument fused with nucellus to form a very delicate membrane extending to near the base of the seed, showing very finely-marked outlines of two sets of cells, one clearer than the other. Megaspore membrane fairly thick, densely granular, occupying nearly the whole interior of the stone.

*Discussion.*—The exterior of the seed is little known; only one specimen provided considerable portions of the epidermis. The majority of the numerous specimens

agreed very well with one another, but a few were distorted by being compressed obliquely, and these suggest that it was originally rather flattened. Every specimen macerated yielded portions of network from the inter-cellular spaces of the stone, and although this network is so soft and fragile that it is rather difficult to mount permanently, it is very easy to recognize in maceration. No known seed yields a similar network, though the internal casts of integument cells of *Caytonia* spp. are of interest for comparison. The specific name is from *rete*, a net, and *mirus*, remarkable and refers to this network.

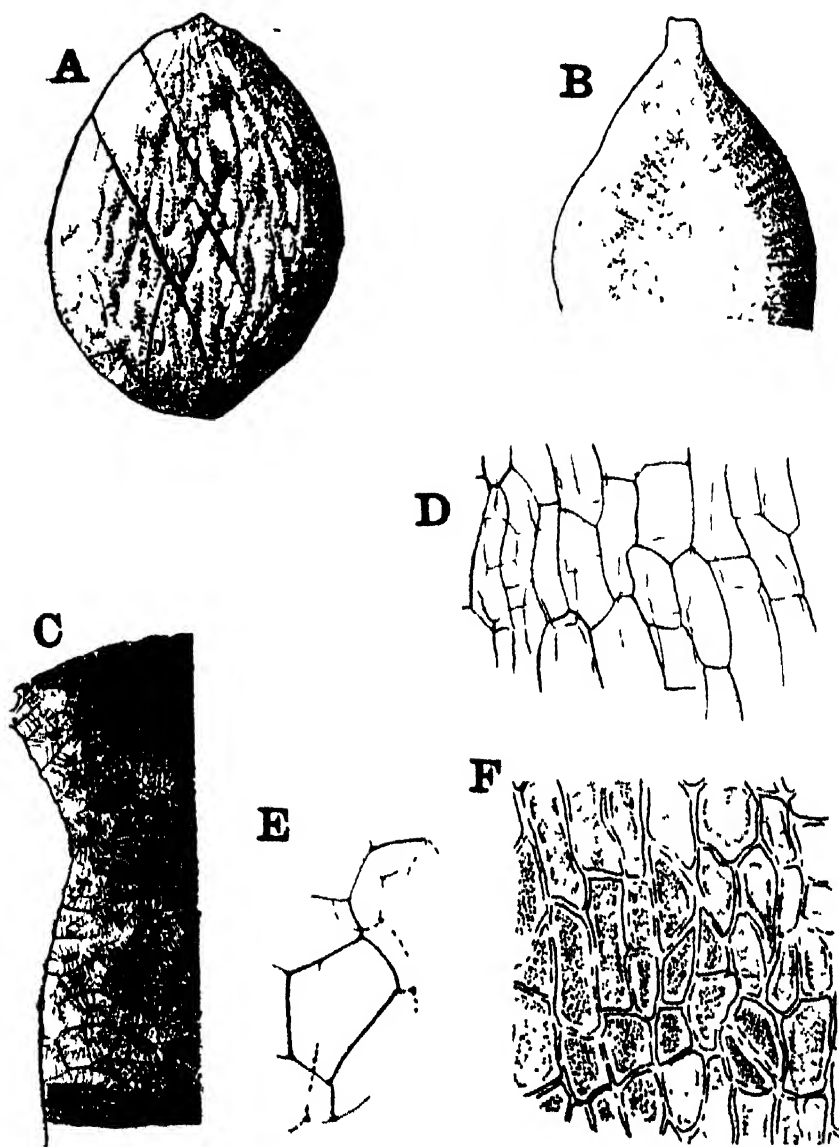
The stone is rather robust and has suffered less compression than most fossils and probably a good deal less than the muddy matrix. It is usually covered with a thin polished film of rock matrix showing slip striations (text-fig. 3 B), and this film must be removed with HF to show the surface of the stone (fig. 3 A).

*The maceration of the stone.*—The usual method of maceration ( $\text{HNO}_3 + \text{KClO}_3$  followed by  $\text{NH}_4\text{OH}$ ) was modified in order to establish the origin of the network derived from the stone. This usual maceration quickly dissolves the cells of the stone to give an opaque blackish solution, and the network is only seen after washing. It was found that the solution of the substance in alkali can be mitigated and controlled satisfactorily in two ways (a) by the use of a weaker alkali, and (b) by the addition of a considerable concentration of NaCl or other salt. Combination of the two methods gives good results.

The brown material from the acid stage of the maceration, consisting of altered lignine and cellulose, behaves as a weak, insoluble acid. It can cause gas evolution from  $\text{NaHCO}_3$ . It is stable on the acid side of neutral (except that long oxidation bleaches and finally dissolves it) but when placed in alkali three changes occur; (1) it darkens in colour, (2) it swells to about its original thickness, (3) it swells further and forms a black colloidal solution. When  $\text{NH}_4\text{OH}$  or  $\text{NaOH}$  are used as alkali it is seldom possible to see any cellular structure.

In a very weak alkali (phosphate buffer at pH 7.8) the darkening occurs quickly and the swelling soon follows, but the solution of the substance takes about an hour and moreover proceeds at different rates on different

Fig. 3.

*Allioaspermum retamirum*, sp. nov.

- A, type-specimen, after cleaning with HF. The micropyle is broken off and the substance is cracked, V. 23945, A,  $\times 10$ . B, stone of seed before cleaning, V. 23945, B,  $\times 10$ . C, fragment from the partly macerated stone extending from the megaspore membrane (at the base) to the surface (at the top), V. 23945, B,  $\times 200$ . D, combined cuticle of nucellus and inside of integument, V. 21389,  $\times 200$ . E, fragment of the net after complete maceration (the size of the meshes increases during maceration), V. 23950,  $\times 800$ . F, outer cuticle of integument, V. 21389,  $\times 200$ .

materials. The action is so slow that the mounting liquid only becomes straw-coloured and it is easy to see the middle lamellæ, pits of the walls, interiors of stone-cells and also the origin of the intercellular network.

The action of salt in high concentration (5-25 per cent. NaCl) is to prevent the walls swelling and dissolving; it thus opposes the alkali, in its second and third effects. A moderately strong alkali + high salt concentration has much the same effect as a weaker alkali + little salt. Probably all salts have this effect, but bivalent metals (Ca, Ba) are far more effective than sodium and can be used to "fix" a partly macerated preparation so that it can be made into a permanent slide.

It was found convenient to use a weakly alkaline (phosphate) buffer at pH 7.4-8.0 rather than highly diluted ammonia and to arrest its action by adding about 20 per cent. NaCl. The plant fragments do not at first dissolve at all, but they begin to swell and then to dissolve when the solution is diluted twice or more.

Various other compressed fossils of the Gristhorpe Bed were examined in this way. It was found easy to demonstrate two sorts of tissue—masses of stone cells and bundles of thick-walled fibres. Although both these presumably lignified tissues show their walls in detail, it has not yet been possible to isolate a pitted tracheid from an ordinary compression.

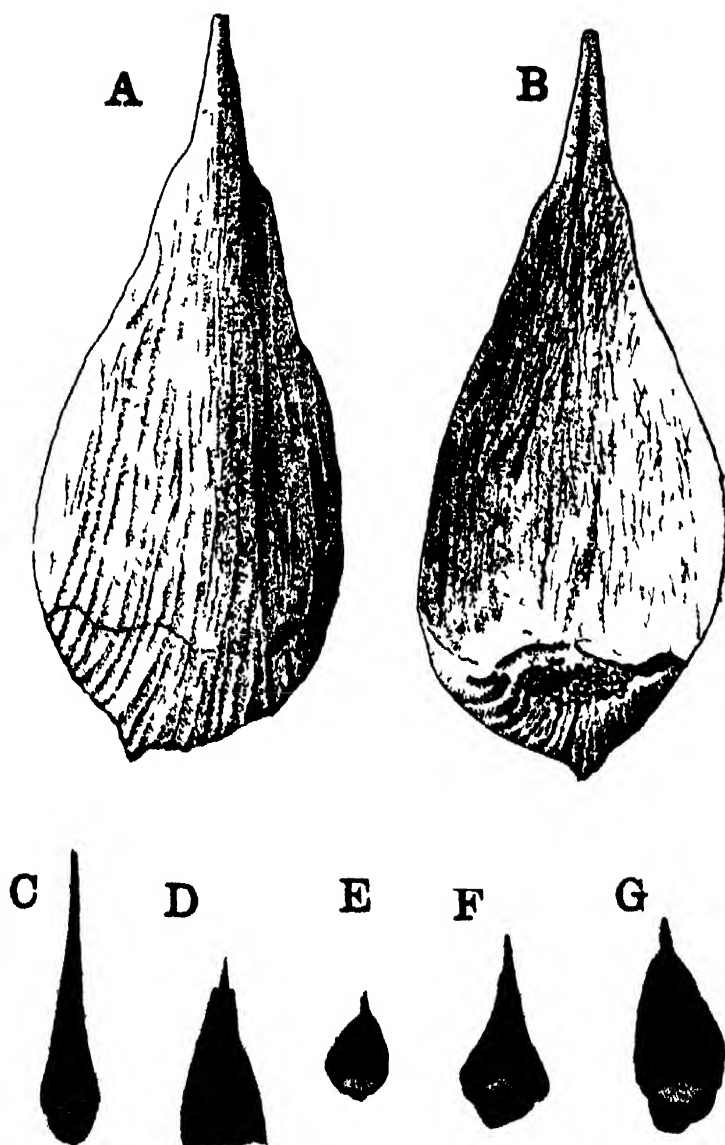
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HARRIS, T. M. 1935. "The Fossil Flora of Scoresby Sound, East Greenland.—Part 4." Medd. om Grønland, cxii. No. 1.

#### 12. *Cycadolepis nitens*, sp. nov. (Figs. 4, 5.)

*Diagnosis*.—Shape of scale-leaf lanceolate, apex mucronate, length typically 12 mm., width typically 5 mm. (extreme lengths 21 and 6 mm., widths 7 and 3 mm.). Surface concavo-convex, substance very thick, back projecting as a keel. Interior containing longitudinal fibres which project on both surfaces as fine longitudinal ridges. Surface-wrinkles and tubercles absent. Outer, convex, side glabrous, glossy, inner side dull, usually covered densely with short fine hairs. Scar of attachment broadly rhomboidal, situated above the

Fig 4



*Cyadolepis nitens*, sp. nov.

A, B, back and front of type-specimen, V. 24722,  $\times 6$ . C, G, specimens of various sizes and shapes. The base is broken in D. The apex is restored by dotted lines in C, F, G. All  $\times 2$ . C, is V. 24721, D, is V. 28944, E, is V. 24725, F, is V. 24724, G, is V. 24704.

base of the concave side ; showing prominences due to ends of fibres.

Cuticle very thick, typically  $10\mu$  on convex and  $5\mu$  on concave side. Cells on both sides isodiametric or slightly elongated, tending to form longitudinal rows. On concave side stomata absent, cell outlines broad, often obscurely marked, straight and entire or with very feeble jagged thickenings. Trichomes typically borne on nearly every cell ; hair-base often indistinct, sometimes covering the whole surface, sometimes distinctly smaller, forming a ring on the surface. Hairs about 1 mm. long, simple, tapering to a fine point, walls fairly thick but with only a thin cuticle on the outside. In occasional specimens concave side almost glabrous.

Convex (lower) side showing a few, scattered stomata, about 3 per sq. mm., trichome bases normally absent but a few sometimes present near margins. Cell outlines very broad, prominent, straight and entire in the lower part of the scale, straight but with more-or-less developed jagged thickenings in the upper part of the scale ; cell-surface flat, coarsely mottled. Stomata usually transversely orientated, subsidiary cells the same size as other epidermal cells, but surface thicker, and margins entire. Cutinized thickenings of guard-cells well developed, aperture sunken in a moderately deep oval pit formed by the subsidiary cells.

Both sides often showing outlines of elongated hypodermal cells.

The name *nitens* refers to the shining outer side.

There were nearly 100 specimens of *C. nitens* in the Wonnacott collection, some of which were used up in the investigation. These were all confined to a few pieces of shale which contain a peculiar flora among which *Ptilophyllum gracile* Harris is conspicuous and is confined to this matrix.

The longitudinal ridges are probably not original features, but caused by the collapse of softer tissues around the fibres. These fibres are remarkably robust and can be seen projecting from broken ends of the scale ; they are particularly clear in certain specimens whose softer internal substance had largely disappeared through rotting before preservation. Here they prove to be separate bodies 2-3 mm. long,  $30\mu$  wide. They are

sparse near the margin, but numerous and overlapping near the middle. The substance of the fibres is dissolved by maceration. The original thickness of the substance of the scale is shown most clearly in specimens compressed obliquely or laterally: it is up to 2 mm. thick along the middle but grows thin by the edges.

The hairs are unusual in being on the concave side, which is seldom exposed by the rock cleavage but needs to be freed from the matrix and cleaned with HF. They are short and fine, but so numerous as to be matted and cover the surface. It is easy to prepare their cuticles, but normally they are lost because they are so much more delicate than the underlying epidermis, and their bases are often hard to recognize, particularly where nearly every cell carries one as wide as itself.

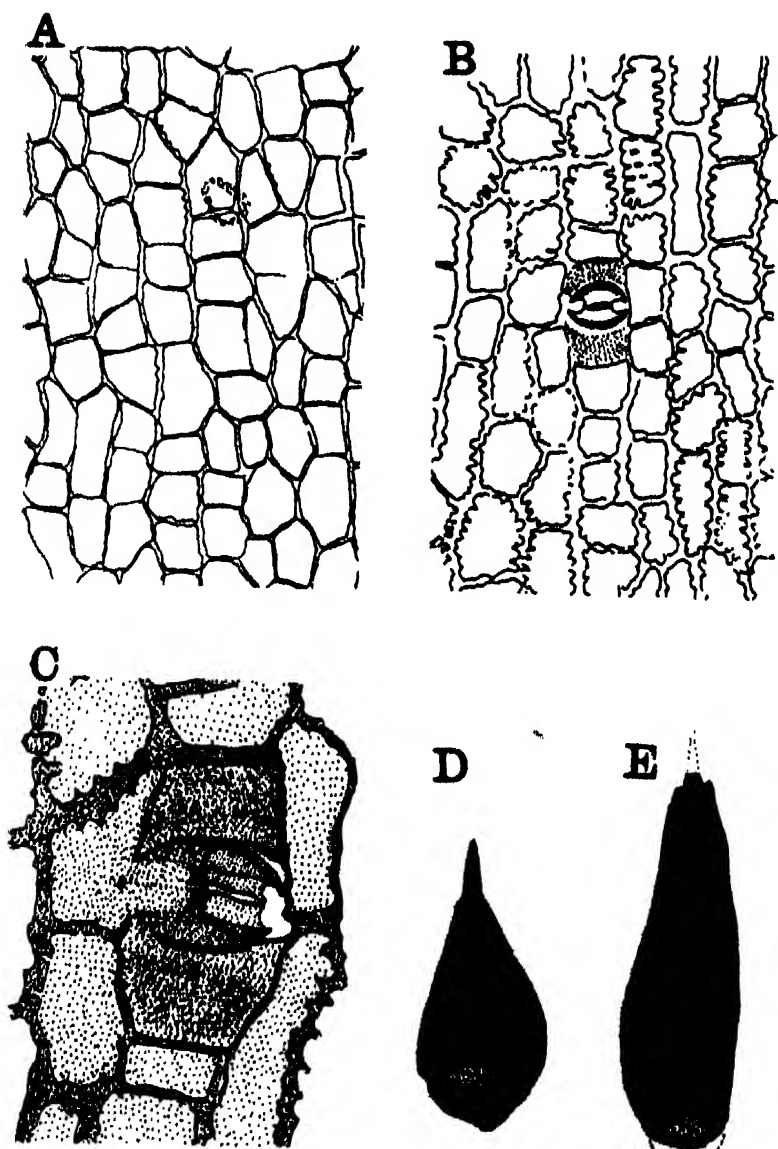
#### *Nature and Attribution.*

*C. nitens* looks like a scale-leaf, and this is supported by the fact that the convex (presumably the lower or outer side) is the more thickly cutinized but has all the stomata. The stomata are, however, so few that the organ can have had very little photosynthetic value, and must have been almost entirely protective. The stomata are of Bennettitalean type and show conclusively that *C. nitens* is a member of that family, like other species of *Cycadolepis*. Certain kinds of *Cycadolepis* are floral bracts while others are probably scales round leaf-buds. There is no direct evidence to show the nature of *C. nitens*, but as there are no associated Bennettitalean flowers it would seem most likely to be vegetative.

The evidence of association suggests that *C. nitens* might belong to the same plant as *Ptilophyllum gracile* Harris, an abundant leaf in this shale and confined to it. The only other associated Bennettitalean leaves are *Nilssoniopteris vittata*, whose scale-leaf is known, and a single specimen of *Ptilophyllum caytonense* Harris. The cuticles of the two fossils look very different (though this may be due to difference of function of the leaf and scale) and give no support: as there is no other evidence the question must be left open.

*Comparison.*—*C. nitens* is better characterized than most species of *Cycadolepis*, at least in its normal form, though extreme specimens would be difficult to determine.

Fig. 5.

*Cycadolepis nitens*, sp. nov.

A, upper cuticle, B, lower (convex side), V. 24695,  $\times 200$ . Although only one hair-base is obvious in A, the hairs were so numerous that nearly every cell must have borne one. C, a stoma compressed rather obliquely showing the pit, V. 24695,  $\times 600$ . D, E, large scale leaves showing attachment scar, both  $\times 2$ . In D, the apex is missing, in E, both apex and base are missing and restored in dotted lines. D, is V. 24720, E, is V. 24723.



but for their association with numerous normal ones. Its special features are its mucronate apex, shining outside, thick but unwrinkled substance, longitudinal ridges due to fibres, and finely hairy inside. The two other *Cycadolepis* species in the Wonnacott collection from the Gristhorpe Bed, *C. stenopus* (Harris, 1943) and the floral bract of *Williamsoniella* (Thomas, 1915, Harris, in the press), differ in every one of these characters, and no species has yet been described with which it could be confused.

*Locality*.—Red Cliff Rocks, Gristhorpe Bed (Middle Estuarine), Cayton Bay, Yorkshire. Collected by Mr. F. M. Wonnacott in 1936 and 1938.

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XLII.—On the Genera of the Tribe Cyphicerini (Col., Curc.).—II. By Sir GUY A. K. MARSHALL, K.C.M.G., F.R.S.

THE section of this tribe of weevils that is characterized by having four or more setæ on the mentum has already been dealt with (*Ann. & Mag. N.H.* (11) xi. 1944, pp. 73-98), and the remaining genera that have only two setæ on the mentum will be treated here.

Of the 29 genera now recognized only 9 were previously described. The group is essentially an Oriental one, there being only a single genus that is not represented in that region, namely, *Syrphax*, which at present seems to be peculiar to Australia. Only two genera (*Amblyrrhinus* and *Mylocerinus*) extend into Africa.

#### Key to the genera of Cyphicerini having only two setæ on the mentum.

- 1 (2). Tarsal claws connate; prothorax as long as broad (Burma) ..... *Epilaisius* Fst.
- 2 (1). Tarsal claws free; prothorax transverse (except in *Parascaphus*).
- 3 (4). Prothorax broadly dilated on each side into a bifurcate process; scape

- of antennæ broadly laminate; lateral areas of rostrum in almost the same plane with the dorsal area, dorso-lateral carinæ parallel (Burma, Indo-China) ..... *Pollendera* Pasc.
- 4 (3). Prothorax not dilated laterally; scape of antennæ not laminate; lateral areas of rostrum steeply declivous.
- 5 (14). Dorso-lateral carinæ on rostrum straight and parallel from base to apex or slightly converging apically, the lateral areas without any oblique curved carina behind the scrobe.
- 6 (7). Rostrum narrowing from base to apex, scrobes extending close up to the eyes or at least behind middle of rostrum, antennæ inserted at or a little behind middle of rostrum (W. Africa to India) ..... *Amblyrrhinus* Schönh.
- 7 (6). Rostrum parallel-sided or widening at apex, scrobes remote from the eyes, antennæ close to apex of rostrum.
- 8 (11). Rostrum transverse, almost parallel-sided; hind tibiæ not mucronate.
- 9 (10). Corbels of hind tibiæ broadly enclosed, the inner carina bare; epistome not reaching a line between the antennæ, its lateral margin forming the inner edge of the scrobe at apex; prothorax widest at base (India) ..... *Hamartus*, g. n.
- 10 (9). Corbels of hind tibiæ open; epistome exceeding a line between the antennæ, its sides not forming the inner edge of the scrobe; prothorax rounded laterally, widest at middle (India) ..... *Scæorrhinus*, g. n.
- 11 (8). Rostrum as long as or longer than broad, distinctly dilated at apex; lateral margin of epistome forming inner edge of scrobe at apex; hind tibiæ mucronate.
- 12 (13). Epistome very short, its hind margin forming a very wide obtuse angle (almost transverse); antennæ squamose, scape with stiff erect setæ; dorsal edge of front tibiæ incurved at apex, corbels of hind pair open (Tonkin, China) ..... *Asporus*, g. n.
- 13 (12). Epistome longer, its hind margin forming a right angle; antennæ setose, scape with recumbent setæ; front tibiæ not incurved at apex, corbels of hind pair with a bare inner carina (India) ..... *Thyrallus*, g. n.
- 14 (5). Dorso-lateral carinæ on rostrum diverging towards apex, or the lateral areas with a curved oblique carina behind the scrobe.

- 15 (30). Epistome short, its hind margin transverse, curved or forming an obtuse angle, the apex of which does not exceed a line between the bases of the antennae.
- 16 (19). Lateral areas of rostrum with an oblique curved carina behind the scrobe; prothorax deeply bisinuate at base.
- 17 (18). Prothorax rounded laterally, widest at middle, of equal width at base and apex, with postocular lobes; eyes flat; scape compressed, parallel-sided distally; front tibiae with a tooth at middle of lower edge, corbels of hind pair with two rows of setae externally (Burma)..... *Diatropus*, g. n.
- 18 (17). Prothorax widest at base (nearly as wide as elytra) and narrowing rapidly to apex, without postocular lobes; eyes convex; scape cylindrical, clavate; front tibiae without a tooth, corbels of hind pair with a single row of setae externally (N.W. Australia) ..... *Syrphax*, g. n.
- 19 (16). Lateral areas of rostrum without an oblique carina.
- 20 (21). Dorsal-lateral carinae on rostrum gradually diverging distally, then curving inwards at apex; prothorax about as long as broad, truncate at base (India) ..... *Parascaphus*, g. n.
- 21 (20). Dorsal-lateral carinae on rostrum curving outwards at apex.
- 22 (23). Epistome very short, indistinct, not exceeding front margin of scrobes; prothorax as long as broad, truncate or slightly arcuate at base (India, Burma) ..... *Rhcnostomus*, g. n.
- 23 (22). Epistome extending far behind front margin of scrobes; prothorax transverse.
- 24 (27). Prothorax deeply bisinuate at base.
- 25 (26). Corbels of hind tibiae entirely open; funicle with joint 1 equal to or longer than 2; scutellum squamose (Turkestan, Arabia to Nigeria) .... *Myllocerinus* Reitt.
- 26 (25). Corbels of hind tibiae with a bare inner carina; funicle with joint 1 shorter than 2; scutellum bare (India) ..... *Agrostes*, g. n.
- 27 (24). Prothorax truncate or only shallowly bisinuate at base.
- 28 (29). Rostrum not longer than broad; prothorax not or only slightly narrower at apex than at base; antennae setose (Burma, Malaya) ..... *Phylladobius*, g. n.
- 29 (28). Rostrum longer than broad; prothorax much narrower at apex than

- at base; antennæ at least partly squamose (India, China to Celebes). *Phytoscapus* Schönh.
- 30 (15). Hind margin of epistome forming a narrow angle (never greater than a right angle) which nearly always extends behind the level of the antennæ.
- 31 (42). Lateral areas of rostrum with a strong oblique curved carina from the inner edge of the scrobe towards the middle of the eye (less developed in *Tanyscapus*).
- 32 (33). Prothorax subtruncate at base, without postocular lobes; antennal scape nearly reaching base of prothorax; rostrum not dilated at the genæ (India) ..... *Tanyscapus*, g. n.
- 33 (32). Prothorax bisinuate at base; scape, at most, only shortly exceeding apex of prothorax.
- 34 (35). Antennal scape without erect or sub-erect setæ, funicle densely squamose (Burma to Java) ..... *Cnaphoscapus*, g. n.
- 35 (34). Antennal scape with fine recumbent setæ, funicle not squamose.
- 36 (37). Rostrum with a transverse carina behind the epistome; corbels of hind tibiæ entirely open; antennal scape stout, strongly bent (India to Borneo) ..... *Deiradolcus* Muhl.
- 37 (36). Rostrum without any transverse carina behind the epistome.
- 38 (39). Corbels of hind tibiæ without a bare internal carina; eyes very small, their length less than half the width of the frons, which is strongly convex transversely (India) ..... *Paurommatus*, g. n.
- 39 (38). Corbels of hind tibiæ with a bare internal carina; eyes large, their length greater than or at least two-thirds the width of the frons, which is flat transversely.
- 40 (41). Prothorax subconical, rapidly narrowing from base to apex, with the sides straight, the base nearly as wide as the elytra, reaching stria 6, its median lobe sharply angulate; median carina on rostrum not ascending the frons (Indo-China) . . *Trapezochus*, g. n.
- 41 (40). Prothorax more or less rounded laterally, shallowly constricted at apex, the base much narrower than the elytra, reaching only stria 5, its median lobe rounded (Indo-China to Australia) ..... *Drymophatus*, g. n.
- 42 (31). Lateral areas of rostrum without an oblique curved carina behind the scrobe.
- 43 (48). Corbels of hind tibiæ enclosed, having either two rows of setæ externally,

- or a single row and a bare internal carina.
- 44 (45). Base of prothorax truncate or feebly bisinuate (India, China, Indo-China). *Cyphicerus* Schönh.
- 45 (44). Base of prothorax deeply bisinuate.
- 46 (47). Eyes very large; width of frons less than the length of an eye, sides of head invisible from above; epistomal setæ fine and sparse (Sumatra). *Thalponomus*, g. n.
- 47 (46). Eyes very small; width of frons more than twice the length of an eye, sides of head visible from above; epistomal setæ broad and dense (India) . . . . . *Hypenephorus*, g. n.
- 48 (43). Corbels of hind tibiae entirely open.
- 49 (52). Prothorax with postocular lobes.
- 50 (51). Dorsal-lateral carinae on rostrum more or less overhanging the lateral areas and ascending the frons, with a deep sulcus immediately below them from scrobe to eye; frons lying high above the level of the eyes (India, Ceylon) . . . . . *Peltotrachelus* Mshl.
- 51 (50). Dorsal-lateral carinae on rostrum not overhanging laterally nor ascending the frons, without a sulcus adjoining them; frons almost or quite on a level with the upper margin of the eyes (India, China to Australia) . . . *Hackera*, Lea.
- 52 (49). Prothorax without postocular lobes.
- 53 (54). Funicle slender, setose, the distal joints much longer than broad; eyes convex.
- 54 (53). Prothorax trapezoidal, much wider at base than at apex, the basal margin deeply bisinuate, its angles acute and extending to stria 6 on the elytra; joint 2 of funicle shorter than 1 (India) . . . . . *Hemerus*, g. n.
- 55 (56). Prothorax not or but slightly wider at base than at apex, the base subtruncate or shallowly bisinuate, its angles rectangular and extending only to stria 5; joint 2 of funicle equal to or longer than 1 (India) . . *Orchobius*, g. n.
- 56 (55). Funicle stout, squamose, the distal joints not or only slightly longer than broad; eyes flat (India) . . . . *Pholicerus*, g. n.

# POLLENDERA Pasc.

## *Pollendera remicornis*, sp. n.

♂. Derm black, with dense greyish-brown scaling; pronotum with a large blackish spot on each side at the base; elytra with a broad common blackish band behind the middle extending to stria 7, and variable blackish mottling on the basal half and on the declivity.

*Head* with the frons almost flat and shallowly striolate under the scaling; eyes moderately convex, highest behind the middle. *Rostrum* very broad, transverse (2:3), parallel-sided; dorso-lateral carinae straight and parallel from base to apex, the dorsal area impunctate beneath the scaling, with a strong median carina that ascends the frons. *Antennæ* black, densely squamose; scape widening rapidly from base to beyond middle, where it becomes almost parallel-sided, the greatest width equal to the length of an eye, the lateral margins sharply carinate, the posterior margin prolonged at its apex into a rounded projection, the stiff setæ recumbent, the underside with a strong longitudinal carina; funicle with joints 1 and 2 equal, 3-7 subequal, as long as or slightly longer than broad. *Prothorax* strongly transverse, the sides of the posterior half being produced laterally into a broad laminate process bifurcate at its apex, the posterior point being longer than the anterior and projecting outwards almost as far as the shoulders of the elytra; the basal margin broadly arcuate, the apex dorsally subtruncate, without postocular lobes; dorsal area almost flat, the deep distant punctures showing partly through the scaling and each containing a short recumbent seta. *Elytra* broadly ovate, separately rounded at the base, the shoulders projecting somewhat laterally and ending in a small sharp granule, the sides sinuate behind the shoulders, widest behind middle, jointly rounded at apex; the dorsal outline convex, highest at middle, the posterior declivity nearly vertical; the striæ containing deep separated punctures that are partly covered by scaling, the intervals broad and slightly convex, with a row of short stiff erect setæ. *Legs* with dense brownish-grey scaling.

*Length* 6.0-6.5 mm., *breadth* 2.8-3.0 mm.

INDO-CHINA: Laos, Vientiane, 4 ♂, 6 ♀, v. 1915 (*R. Vitalis*).

This remarkable genus was previously represented by a single species, *P. atomaria* Mot., which differs in lacking the broad blackish band on the elytra; further the scape of the antennæ is narrower, its greatest width being much less than the length of an eye, the anterior margin of the pronotum is strongly arcuate or even subangulate, and the setæ on the elytra are squamiform and recumbent.

## HAMARTUS, gen. nov.

*Head* with the eyes almost round and nearly flat; the dorso-lateral carinae of the rostrum invading the frons, the width of which equals the length of an eye. *Rostrum* broad, transverse, parallel-sided or slightly wider apically, continuous with the head; the dorso-lateral carinae elevated, quite straight and parallel from base to apex; lateral areas without any oblique carina behind the scrobes, which are very broad, parallel and entirely dorsal; epistome very short and nearly vertical, its carinate hind margin forming an obtuse angle which does not reach a line between the antennae, and anteriorly this margin forms the inner boundary of the scrobe (instead of the usual extension of the dorso-lateral carina); mentum with two setae. *Antennae* squamose; scape subcylindrical, gradually clavate; funicle with the two basal joints equal. *Prothorax* somewhat transverse, widest at the deeply bisinuate base and narrowing with a gentle curve to the apex, the postocular lobes feeble. *Elytra* much wider at the shoulders than the prothorax, separately rounded at apex. *Legs* with a sharp femoral tooth; front tibiae not sinuate at base, middle pair somewhat curved, corbels of hind tibiae broadly enclosed, the inner carina bare.

Genotype: *Corigetus instabilis* Mshl., 1925.

The single species occurs only in India.

It is very unusual for the sides of the epistome to form part of the inner boundary of the scrobe, owing to the apical abbreviation of the straight dorso-lateral carina, but this character also occurs in two new genera described below, *Asporus* and *Thyraulus*.

## SCÆORRHINUS, gen. nov.

*Head* with the eyes very large, nearly round, flat, the width of the frons equal to or greater than the length of an eye. *Rostrum* very stout, nearly as wide as the head, transverse, slightly dilated at apex, continuous with the frons; scrobes dorsal, very broad, continued indefinitely nearly to the eyes, without any oblique carina behind them; dorso-lateral carinae more or less raised, straight and parallel from base to apex, not ascending the frons; epistome elongate, its carinate hind margin forming a

sharp acute angle that extends well behind the antennæ but does not adjoin the scrobes anteriorly ; mentum with two setæ. *Antennæ* with the scape cylindrical, gradually widening from base to apex, with recumbent setæ and narrow scales ; funicle stout, more or less squamose. *Prothorax* transverse, rounded laterally, the bisinuate base not or only slightly wider than the apex, without postocular lobes. *Elytra* much wider at the roundly rectangular shoulders than the prothorax, slightly dehiscent at the apex. *Legs* with a sharp femoral tooth ; front tibiæ not sinuate at base, middle pair straight, corbels of hind pair entirely open.

Genotype : *Scæorrhinus boops*, sp. n.

The structure of the rostrum and the very large flat eyes are distinctive. Another undescribed Indian species is known.

*Scæorrhinus boops*, sp. n.

♂♀. Derm black, with fairly dense light brown scaling above, the elytra with the following indistinct greyish-white markings : a narrow transverse band along the basal margin, stripes on the apical fourth of intervals 3, 4, 7, 8, 9 and at the apex of the suture, and a very variable transverse band before the middle between striae 1 and 8, usually interrupted on interval 5 ; under-side uniformly grey.

*Head* with the coarse punctation almost hidden by the narrow scales, without any median fovea. *Rostrum* very broad, transverse (7 : 9), widening very slightly from base to apex ; dorsal area with its sides raised into high parallel carinate ridges and with a low median carina, the narrow scales fairly dense ; the broad lateral areas flat and smooth, more sparsely squamose. *Antennæ* with the scape coarsely punctate, with narrow pale scales and recumbent setæ ; funicle with rather dense narrow whitish scales on joints 2 and 3, joint 1 somewhat longer than 2. *Prothorax* transverse (2 : 3), strongly rounded laterally, widest behind the middle, broadly and deeply constricted before the bisinuate base, so that the basal angles project somewhat, the apex truncate ; dorsum moderately convex longitudinally, the close coarse punctation almost concealed by dense narrow scales. *Scutellum* subquadrate, sparsely squamose. *Elytra* parallel from the roundly rectangular shoulders to beyond middle ; the



striae impressed, partly covered by scaling, but the ovate punctures clearly showing through; the intervals slightly convex, rugose, with numerous small granules bearing appressed scale-like setae. Legs black, with fairly close uniform grey scaling.

Length 4.5–6.0 mm., breadth 2.5–2.8 mm.

S. INDIA: North Salem, Noganoor, 1♂, 2 ♀, v. 1930, v. 1931.

ASPORUS, gen. nov.

*Head* with the frons flat, wider than the dorsal area of the rostrum; eyes almost flat, broadly ovate, much shorter than the width of the frons (2:3). *Rostrum* as long as broad, dilated at the genae; the dorso-lateral carinae quite straight and parallel from base to apex; scrobes well defined, short, almost parallel; epistome very short, its carinate hind margin forming a wide obtuse angle that does not reach the antennae, its apical angles prominent; mentum with two setae. *Antennae* squamose, scape gradually widening to apex, funicle with joint 1 longer than 2. *Prothorax* transverse, widest at the bisinuate base, postocular lobes feeble. *Elytra* much wider at the shoulders than the prothorax, dehiscent at the apex. *Legs* with a sharp femoral tooth; front tibiae sinuate at base, middle pair somewhat curved dorsally, hind pair with a strong mucro, the corbels open.

(Genotype: *Asporus setarius*, sp. n.)

*Asporus setarius*, sp. n.

♂. Derm piceous, with dense sandy-brown scaling, paler beneath, and mottled above with very faint darker and paler markings.

*Head* with dense concave scales that entirely conceal the sculpture, the frons quite flat. *Rostrum* parallel-sided in the basal half, dilated apically; the dorsal area broadly impressed, the sculpture hidden by overlapping concave scales, with short erect setae along its parallel margins: lateral areas with a longitudinal carina that bifurcates anteriorly, thus enclosing the scrobe. *Antennae* with dense pale brown scaling and stiff erect setae on the scape, funicle with dense whitish scales on joints 2–4, 5–7 subequal and transverse. *Prothorax* gradually narrowing, with a slight curve from base to apex, the

lateral angles of the bisinuate base produced into a short sharp point, the apical margin truncate; dorsum flat longitudinally in the middle, with coarse separated punctures that are entirely covered by dense scaling and only shallowly apparent, each containing a short erect seta. *Scutellum* subquadrate, with dense whitish scales. *Elytra* parallel from the obliquely prominent shoulders to beyond middle, the dorsal outline moderately convex; the impressed striae covered with dense scales, except where the deep punctures show through like distant pin-holes; the intervals slightly convex, each with a row of short stiff erect setae. *Legs* with dense pale brown scaling; all the tibiae with a sharp mucro, the front pair with the dorsal edge curved inwards at the apex.

*Length* 3.5–4.0 mm., *breadth* 1.5–1.7 mm.

INDO-CHINA: Tonkin, Cho-Ganh, 2 ♂ (*L. Duport*).  
CHINA: Hong Kong, 1 ♂.

#### THYRAULUS, gen. nov.

*Head* with the frons slightly above the upper level of the eyes, which are almost round and only very slightly convex. *Rostrum* longer than broad, dilated at the apex, the upper and lower surfaces parallel; the dorso-lateral carinae straight and parallel from base to apex, the lateral areas without any oblique carina; scrobes very short; epistome with its hind margin sharply carinate, forming an acute angle that slightly exceeds the antennae, its sides anteriorly forming the inner boundary of the scrobe; mentum with two setae. *Antennae* long and slender; scape cylindrical, gradually clavate, with recumbent setae; funicle with joint 2 much longer than 1, distal joints elongate. *Prothorax* with the base deeply bisinuate and the postocular lobes well developed. *Scutellum* subquadrate, bare. *Elytra* separately rounded at the base, dehiscent at the apex. *Legs* with a small sharp femoral tooth; front tibiae straight dorsally, corbels of hind pair with a bare inner carina.

*Genotype*: *Thyraulus prasinus*, sp. n.

#### *Thyraulus prasinus*, sp. n.

♂♀. *Derm* black, with dense uniform pale green scaling, but the elytra often with a small round blackish spot at the top of the declivity on interval 3 and another before

middle on interval 5, these being due to the scales being there much reduced in size; venter with narrower grey scales, the round green scales being confined to the sides.

*Head* with the frons somewhat wider than the dorsal area of the rostrum, its width twice the length of an eye, with a small median fovea. *Rostrum* slightly longer than broad, narrowing very gradually from base to antennæ, then dilated at the genæ; the dorsal area almost flat, the lateral carinæ obtuse and covered with scaling, the fine median carina also normally concealed except at its apex. *Antennæ* piceous, the scape and first three joints of the funicle with fine hair-like scales. *Prothorax* transverse (3:4), gently rounded laterally, widest at middle, very shallowly constricted at base and apex, the latter very nearly as wide as the base and its dorsal margin truncate; dorsum flat longitudinally in the middle, with the large separated punctures almost entirely covered by scales and with a small depression on each side near the base. *Elytra* rather narrow at the obliquely rounded shoulders, only slightly wider behind the middle in ♂, broader and more dilated behind in ♀, the dorsal outline almost flat in ♂, feebly convex in ♀; the shallow striæ mostly covered by scaling, the punctures showing through like small slits; the intervals flat, with numerous short appressed setæ, the scales small, round and of the same size as those on the pronotum. *Legs* piceous to ferruginous, with dense green scaling.

*Length* 4.8–7.5 mm., *breath* 1.9–3.2 mm.

S. INDIA: Nilgiri Hills, 20 ♂, 16 ♀ (*H. L. Andrewes*).

A second new species is known, also from South India.

#### DIATROPUS, gen. nov.

*Head* with the frons on a level with the upper edge of the eyes, which are large, broadly ovate and quite flat. *Rostrum* continuous with the frons, as long as broad, strongly dilated at the apex, with the upper and lower surfaces parallel; dorso-lateral carinæ curving strongly outwards at apex, the lateral areas with an oblique curved carina running from the inner margin of the scrobe towards the middle of the eye; epistome short, its carinate hind margin forming a regular curve that does not reach the level of the antennæ; mentum with two setæ. *Antennæ* with the scape broad, compressed,

of almost equal width from near base to apex, squamose, with subrecumbent setæ; joint 2 of funicle longer than 1, distal joints longer than broad. *Prothorax* somewhat transverse, rounded laterally, deeply bisinuate at the base, which is scarcely wider than the apex, the postocular lobes distinct. *Scutellum* almost round, bare. *Elytra* with obliquely rounded shoulders, parallel, dehiscent at apex. *Legs* with a small femoral tooth; front tibiæ with a sharp tooth in the middle of the lower edge, corbels of hind pair enclosed with two rows of setæ.

Genotype: *Cyphicerus indagator* Fst.

Only a single Burmese species is known.

SYRPHAX, gen. nov.

*Head* continuous with the rostrum, frons flat or concave, eyes very broad oval, convex. *Rostrum* broader than long, moderately dilated at the genæ, the lower surface not parallel with the upper, sloping obliquely; the dorso-lateral carinæ converging somewhat from base to middle and curving strongly outwards at apex; lateral areas with a strong oblique carina from the inner margin of the scrobe towards the middle of the eye; scrobes broad, curving inwards behind; epistomè short, its finely carinate hind margin forming a wide angle which hardly reaches the line of the antennæ; mentum with two setæ. *Antennæ* squamose; scape cylindrical, gradually clavate, with short recumbent setæ; funicle with joint 1 longer than 2, the distal joints longer than broad. *Prothorax* more than twice as broad as long, widest at the deeply bisinuate base, which is nearly as broad as the elytra at the shoulders, rapidly narrowing thence to the apex with the sides almost straight, the apical margin sinuate dorsally, without postocular lobes but with distinct vibrissæ. *Elytra* only slightly wider at the shoulders than the base of the prothorax, parallel to beyond middle, dehiscent at apex. *Legs* with a rudimentary femoral tooth; front tibiæ not sinuate at base, corbels of hind pair entirely open.

Genotype: *Mylocerus incurvus* Lea (N.W. Australia).

*Mylocerus bovilli* Blkb., from N. Australia, also belongs to this genus, which has a distinctive facies owing to the unusual width of the prothorax.

Judging by the descriptions, the following species of *Mylocerus* from N. Australia will also probably prove to

be referable to the genus *Syrphax*:—*latibasis*, *fieldi*, *blackburni* and *tristis*, all Lea, 1914.

PARASCAPHUS, gen. nov.

*Head* more deeply immersed in the prothorax than usual; frons on a level with the eyes, which are flat, ovate and rather acuminate below. *Rostrum* distinctly longer than broad, dilated at the genæ, the upper and lower surfaces parallel; dorso-lateral carinæ gradually diverging anteriorly then curving slightly inwards at apex, the lateral areas without any oblique carina; epistome very short, almost vertical, the blunt margin forming a wide angle which hardly reaches to the level of the front margin of the scrobes; scrobes nearly parallel-sided, extending backwards more than half-way to the eyes; mentum with two setæ. *Antennæ* squamose; scape cylindrical, gradually clavate; funicle with the two basal joints equal. *Prothorax* as long as broad, rounded laterally, truncate at base, which is only slightly wider than the apex, postocular lobes well developed. *Scutellum* very small, slightly elevated. *Elytra* broadly ovate, truncate at base, widest behind middle, jointly rounded at apex, with obliquely prominent shoulders. *Legs* with a small sharp femoral tooth; tibiæ mucronate, front pair bisinuate on lower edge and somewhat incurved at apex, middle pair straight dorsally, corbels of hind pair open.

Genotype: *Phytoscaphus dissimilis* Mshl.

The inward curvature of the dorso-lateral carinæ on the rostrum and the comparatively long prothorax are distinctive features. A second undescribed species is known, also from India.

RHICNOSTOMUS, gen. nov.

*Head* continuous dorsally with the rostrum, frons slightly higher than the eyes, which are broadly ovate and almost flat. *Rostrum* as long as or longer than broad, much narrower at the base than the head, moderately dilated at apex, the upper and lower surfaces nearly parallel; the dorso-lateral carinæ somewhat obscured by scaling, curving outwards at the apex, the lateral areas without any oblique carina; epistome rather indistinct,

very short, steep, forming a wide angle that does not exceed the front margin of the scrobes; mentum with two setæ. *Antennæ* setose; scape nearly straight, gradually clavate; funicle with joint 1 equal to or longer than 2. *Prothorax* about as long as broad, not wider at the truncate or slightly arcuate base than the apex, the postocular lobes moderate. *Elytra* suboblong, with roundly rectangular shoulders, jointly rounded at apex, more or less flattened on the disk, jointly sinuate at base. *Legs* with a very small sharp femoral tooth; front tibiæ shallowly bisinuate on the lower edge, middle pair straight, corbels of hind pair open.

Genotype: *Rhichnostomus terrenus*, sp. n.

A second species is known from Burma.

In their small size and general facies these species resemble *Epilasius* Fst., which also has an inconspicuous epistome; but apart from its connate claws, the latter differs in having a carina in the hind corbels, and ventrite 2 is twice as long as 3+4, with its anterior margin strongly angulate; whereas in this genus ventrite 2 is equal to 3+4, with its anterior margin truncate.

*Rhichnostomus terrenus*, sp. n.

♂♀. Derm ferruginous, with dense greyish-brown scaling; prothorax with an indefinite dark stripe on each side, often reduced to a basal spot; elytra sometimes uniform, but usually with irregular dark spots, especially on the posterior declivity.

*Head* with the width of the frons much greater than the length of an eye, with a minute median stria. *Rostrum* a little longer than broad, narrowing slightly from base to antennæ and moderately dilated at the genæ, without any median basal projection on the underside; the dorsal area behind the antennæ appearing quite flat, the fine median and lateral carinæ concealed by dense scales that are larger than those on the head. *Antennæ* ferruginous; funicle with joint 1 nearly as long as 2+3, 3-7 transverse. *Prothorax* about as long as broad, rounded laterally, widest behind the middle, with a broad shallow constriction at the apex; dorsum flat longitudinally in the middle, the close strong punctures entirely hidden by scaling. *Scutellum* subquadrate, slightly raised, densely squamose. *Elytra* parallel for more than

two-thirds their length from the roundly rectangular shoulders, the dorsal outline quite flat to beyond middle ; the shallow striæ with close subquadrate punctures, which are only partly visible through the scaling ; the intervals broad, almost flat, with a regular row of short strap-like setæ, which are longer and more erect on the declivity. *Legs* ferruginous, with dense grey scaling.

*Length* 2.5-3.0 mm., *breadth* 1.0-1.2 mm.

INDIA : Bihar, Pusa, 10♂, 9♀, vii.-xii. 1904, vii. 1915.

Many of the specimens available are recorded as having been found under the soil and some at the roots of "motha" ; Mr. S. Maulik kindly informs me that this name is applied to *Cyperus rotundus* L., the aromatic tubers of which are ground up and used medicinally.

#### MYLLOCERINUS Reitt.

Reitter did not designate a type for this genus, and *M. heydeni* Faust is therefore proposed as the genotype.

Of the species mentioned in the 'Catalogus,' *fischerianus* Sumakov has already been sunk as a synonym of *setulifer* Reitt. and transferred to the genus *Hypsedaphus* Mshl., 1944, to which *crassicornis* Desbr. also belongs. *Mylocerus arabicus* Boh. must also come here, as well as *Corigetus decorsei* Hust. and *rubripes* Hust. The following African species of *Corigetus* are known to me only from description, but should provisionally be placed in *Mylocerinus* :—*africanus* Hust., *humilis* Gestro, and *solskyi* Faust.

#### AGROSTES, gen. nov.

*Head* with the frons slightly higher than the upper level of the eyes, which are nearly round and almost flat. *Rostrum* continuous with the frons, nearly as broad at the base as the head, not or moderately dilated at the genæ, with the upper and lower surfaces parallel ; dorso-lateral carinæ slightly curved outwards at apex, the lateral areas without any oblique carina ; epistome with a high carina, which is curved or forms an obtuse angle, reaching the level of the antennæ ; mentum with two setæ. *Antennæ* comparatively slender, setose ; scape cylindrical, gradually clavate ; funicle with joint 2 longer than 1. *Prothorax* transverse, narrower at the apex than at the deeply bisinuate base, the postocular

lobes well developed. *Scutellum* subquadrate, bare. *Elytra* with roundly rectangular shoulders, more or less dilated behind middle in both sexes, slightly dehiscent at the apex. *Legs* with a small femoral tooth: front tibiae straight, not sinuate at the base, corbels of hind pair with a bare inner carina

(Genotype: *Agrostes varisetis*, sp. n.

A second undescribed Indian species is also known.

*Agrostes varisetis*, sp. n.

♂♀. Derm black to piceous, with dense grey or pale brown scales (these colours often intermingled on the elytra), more rarely with pale green scaling, especially on the prothorax and rostrum.

*Head* with the frons wider than the length of an eye, very shallowly depressed anteriorly, with a minute median fovea; eyes large. *Rostrum* as long as broad, stout, nearly as broad at its base as the head, gradually narrowing to the antennae and not or only slightly dilated at the genae; the dorsal area flat or very shallowly depressed, nearly as wide as the frons, parallel-sided from the base to the scrobes, then widening slightly, with a fine median carina that shortly ascends the frons, and not very densely squamose. *Antennae* with joints 3-7 of the funicle much longer than broad, subequal, somewhat clavate. *Prothorax* transverse (3:4), rounded laterally, widest behind middle, with a broad shallow constriction at the apex; dorsum flat longitudinally in the middle, with fairly dense punctures that are clearly visible through the scaling and a round impression on each side near the base, the scales not larger than those on the elytra. *Elytra* much broader at the roundly rectangular shoulders than the prothorax, slightly dilated behind middle in ♂, more so in ♀; the shallow striae mostly covered by scaling, the punctures showing through as narrow slits; the intervals only slightly convex, broad, with irregular variable setae, which are sometimes short and recumbent throughout, but more often suberect on the posterior declivity, while in some ♀♀ they are much longer and erect on that area. *Legs* with moderately dense grey or pale brown scaling.

*Length* 4.7 mm., *breadth* 1.6-3.0 mm.



S. INDIA : Nilgiri Hills, 24 ♂, 17 ♀ (*Sir George Hampson, H. L. Andrewes*—type) ; Coimbatore, 2 ♂, 2 ♀, x. 1917 ; Malabar, 1 ♀.

In the British Museum there are two old specimens labelled as from Java, but the locality seems very dubious.

A second new species is known from the Nilgiris.

PHYLLADOBIUS, gen. nov.

*Head* with the frons continuous with the rostrum and almost on a level with the eyes, which are more or less convex. *Rostrum* not longer than broad, rather strongly dilated at the genæ ; dorso-lateral carinæ rapidly curving outwards at apex, the lateral areas without any oblique carina ; epistome with the carinate hind margin forming a broad curve or almost transverse ; mentum with two setæ. *Antennæ* slender, elongate, setose ; scape sub-cylindrical, only slightly and gradually clavate ; funicle with joint 2 longer than 1, the distal joints elongate. *Prothorax* transverse, with the apex not or but slightly narrower than the truncate or feebly bisinuate base, the postocular lobes distinct. *Elytra* much wider at the roundly rectangular shoulders than the prothorax, jointly rounded at the apex. *Legs* with a small femoral tooth ; front tibiæ not sinuate at the base, the corbels of the hind pair with a bare inner carina.

Genotype : *Phylladobius herbeus*, sp. n.

In addition to the Malayan genotype two other species are known from Burma and Malaya. They closely resemble *Cyrtepistomus* Mshl., but in the latter genus the mentum bears four setæ and the postocular lobes of the prothorax are absent or obsolescent.

*Phylladobius herbeus*, sp. n.

♂♀. Derm black, with uniform pale green scaling above and below, sometimes dusted with white powder.

*Head* with the frons about as wide as the length of an eye, flat in ♀, shallowly depressed in the middle in ♂, with a short deep median stria and a few minute granules, but both of these hidden by scaling ; eyes broadly ovate, slightly convex. *Rostrum* about as long as broad, rather stout, gradually narrowing from base to antennæ, rather strongly dilated at the genæ ; dorsal area depressed in the middle, with a fine low abbreviated median carina and an indis-

tinct transverse ridge behind the epistome, beyond which the median carina is distinct, and a fine carina adjoining the dorso-lateral carinae externally; epistome forming a broad curve. *Prothorax* transverse (7:10), almost parallel-sided in front, slightly narrowed at the base, which is not wider than the apex and very feebly bisinuate; dorsum flat along the middle, with dense rugulose punctures that are almost entirely hidden by scaling. *Elytra* parallel to beyond middle in ♂, wider behind in ♀; with comparatively deep striae containing strong close punctures which are partly concealed by scaling; the intervals somewhat convex, with numerous short white spatulate recumbent setae. *Legs* black or piceous, with rather sparse green scales, the tibiae mostly with setiform grey scales.

*Length* 4-6 mm., *breadth* 1.5-2.5 mm.

MALAYA: Penang, 3 ♂, 3 ♀ (*Lamb*, ('*F. Baker*).

#### TANYSCAPUS, gen. nov.

*Head* with the frons continuous with the rostrum, very broad, on a level with the upper edge of the eyes, which are broadly ovate and strongly convex. *Rostrum* transverse, very broad, the sides forming a continuous line with those of the head, not dilated at the genae, the upper and lower surfaces parallel: dorso-lateral carinae indistinct in basal half, strongly curved outwards at apex, lateral areas with a weak oblique costa from the inner edge of the scrobe to the middle of the eye: epistome elongate, the carinate margin forming a narrow angle that extends behind the antennae; mentum with two setae. *Antennae* elongate, setose; scape strongly curved, nearly reaching base of pronotum. *Prothorax* transverse, subcylindrical, of equal width at base and apex, the base subtruncate, no postocular lobes. *Elytra* much wider at the roundly rectangular shoulders than the prothorax, parallel to well behind the middle in ♀, jointly rounded at apex. *Legs* with a small sharp femoral tooth; front tibiae not sinuate at base, corbels of hind pair open.

Genotype: *Tanyscapus compressus*, sp. n.

*Tanyscapus compressus*, sp. n.

♀. Derm black, with dense uniform pale green scales above and below.

*Head* with the sculpture hidden by scales except for a fine short median stria, width of frons much greater than the length of an eye (5 : 3), the strongly convex eyes highest behind middle. *Rostrum* transverse (5 : 7), gradually narrowing from the base to the undilated apex, with the sides straight; dorsal area ill-defined, flat, with a partly concealed fine median carina. *Antennæ* piceous to red-brown, the strongly curved elongate scape with short subrecumbent setæ; funicle with joint 1 nearly as long as 2+3, 4-7 elongate and subequal. *Prothorax* transverse (3 : 4), the sides almost straight and parallel, the dorsal apical margin gently arcuate and with a fringe of horizontally projecting scales; dorsum with two transverse impressions, one before and the other behind middle, the punctation concealed. *Elytra* comparatively narrow, compressed, so that they are highest along the suture, the dorsal outline strongly convex, highest behind middle; the narrow impressed striæ with small punctures that are only partly visible; the intervals slightly convex, with somewhat irregular rows of short broad subrecumbent white setæ, which are very numerous along the suture. *Legs* black to piceous, with not very dense green and greyish scales.

*Length* 4.0-4.7 mm., *breadth* 1.3-1.5 mm.

BENGAL: Kalimpong, 4000 ft., 1 ♀, vii. 1924 (*Major R. W. G. Hingston*—type); Buxar Duars, 1 ♀, v. 1907 (*D. Nowroji*).

The unusually elongate scape and the compressed elytra should make the species easily recognizable.

CNAPHOSCAPUS, gen. nov.

*Head* with the frons of variable width, declivous, flat transversely, on a level with the top of the eyes or only slightly higher; eyes large, nearly round, almost flat or slightly convex. *Rostrum* varying from broader than long to a little longer than broad, strongly dilated at the genæ, the upper and lower surfaces not parallel; dorso-lateral carinæ subparallel in the basal half and diverging anteriorly, with a transverse carina behind the epistome; the lateral areas with a strong curved oblique carina from the inner edge of the scrobe towards the middle of the eye and a narrow longitudinal carina above it (sometimes hidden by scaling); scrobes short, broad, somewhat

curved inwards behind; epistome with its sharply carinate hind margin forming an acute angle that slightly exceeds the antennæ; mentum with two setæ. *Antennæ* squamose; scape very stout, with stiff broad erect or suberect setæ, usually very dense; funicle with joint 1 equal to or slightly longer than 2. *Prothorax* transverse, much narrower at the apex than at the bisinuate base, the postocular lobes variable. *Elytra* much wider at the roundly rectangular shoulders than the prothorax, separately rounded at apex. *Legs* with a sharp femoral tooth; front tibiæ either straight on the lower edge or with an angulation at one-third from base, corbels of hind pair open.

Genotype: *Cnaphoscapus bisignatus*, sp. n.

The typical species of this genus have a very distinctive antennal scape which is very densely clothed with stiff setæ; but with them must be associated *Cyphicerus decoratus* Fst., which has much less numerous setæ on the scape. *Cyphicerus nigroclavatus* Aur. and *C. patricius* Fst. have proved, on examination of the types, to be synonyms of *decoratus*. Six undescribed species are known from Burma, Indo-China, Malaya and Java.

*Cnaphoscapus bisignatus*, sp. n.

♂♀. Derm black, with blackish scaling and pale brown and whitish markings; rostrum pale coppery brown; head dark in the middle with a coppery stripe along each eye; prothorax with three irregular stripes of pale coppery brown; elytra with an obliquely transverse macular whitish band on intervals 5-8 behind the middle, the remaining surface mottled with more or less confluent pale coppery-brown spots which form more definite patches in the humeral angles and behind the scutellum; underside with fairly dense coppery-grey scales.

*Head* with the width of the frons greater than the length of an eye (3 : 2), shallowly striolate and with a deep median fovea, hidden by scaling; eyes almost flat. *Rostrum* as long as broad, parallel-sided in the basal half, strongly dilated at the genæ; the dorsal area flat in the basal half and deeply impressed in front, with a sharp median carina; the angle of the epistome higher than the transverse carina. *Antennæ* with the broad scape gradu-

ally widening distally, with very dense broad suberect black and brown setæ; funicle with joints 1 and 7 blackish, 2-6 with dense greenish-white scales, 1 slightly longer than 2. *Prothorax* transverse (3:4), almost parallel-sided near base and narrowing in a curve to apex; dorsum flat down the middle, with large deep close punctures that are fully visible through the scaling and a shallow round depression on each side behind the middle. *Elytra* broadly ovate, parallel in ♂, very slightly wider behind middle in ♀; the dorsal outline gently convex, the broad striæ containing large deep punctures that are fully visible; the intervals hardly broader than the punctures, convex, the alternate one being slightly higher, each with a row of small granules bearing a short erect setæ. *Legs* with uneven coppery scaling; front tibiæ slightly incurved at apex, without any angulation or sinuation beneath.

*Length* 5.5-6.5 mm., *breadth* 2.5-3.0 mm.

MALAYA: Perak, 5 ♂, 1 ♀ (*Doherty*).

PAUROMMATUS, gen. nov.

*Head* with the frons raised high above the level of the eyes, which are small, nearly round, rather strongly convex, and highest much behind the middle. *Rostrum* about as long as broad, only slightly dilated at the genæ, the upper and lower surfaces parallel; dorsal area elevated, shortly encroaching on the frons, the lateral carinæ parallel in the basal half and diverging strongly in front; lateral areas with a strongly curved carina from the inner edge of the scrobe towards the middle of the eye; the carinate margin of the epistome forming a sharp acute angle that extends a little behind the antennæ; mentum with two setæ. *Antennæ* setose; scape comparatively slender, cylindrical, almost straight, widening slightly from base to apex; funicle with joint 1 much longer than 2, the distal joints elongate. *Prothorax* transverse, not constricted at the apex, which is only a little narrower than the deeply bisinuate base, without any postocular lobes. *Scutellum* bare. *Elytra* much wider at the rounded shoulders than the prothorax, widened behind middle in both sexes, separately rounded at apex. *Legs* with a small sharp femoral tooth; front

tibiæ distinctly sinuate beneath at base, corbels of hind pair open.

Genotype : *Pellotrachelus smaragdus* Mshl.

*Pellotrachelus* Mshl. differs from the present genus in having well-developed postocular lobes on the prothorax, the apex of which is broadly though shallowly constricted and much narrower than the base ; the shoulders of the elytra are much narrower in relation to the base of the prothorax ; and the lateral areas of the rostrum lack the curved carina.

*TRAPEZAUCHEN*, gen. nov.

*Head* with the frons but little higher than the level of the eyes, which are only slightly convex. *Rostrum* about as long as broad, narrower at the base than the head, strongly dilated at the genæ, the lower surface not parallel with the upper one ; dorso-lateral carinæ slightly converging towards the base, curving outwards at the apex, without a transverse carina behind the epistome ; lateral areas with an oblique costa (sometimes rather indistinct) ; epistome with its carinate margin forming a sharp acute angle that extends shortly behind the antennæ ; mentum with two setæ. *Antennæ* with the scape slightly or strongly compressed, gradually widening from base to apex, with recumbent setæ ; funicle with joint 2 equal to or longer than 1. *Prothorax* transverse, rapidly narrowing from base to apex, with the sides straight, the base nearly as wide as the elytra, reaching stria 6, deeply bisinuate, with its median lobe sharply angulate, not constricted at apex, the postocular lobes well developed. *Elytra* with the narrow shoulders sloping, parallel to beyond middle in both sexes, separately rounded at apex. *Legs* with a small sharp femoral tooth ; front tibiæ sinuate at the base, corbels of hind pair with a bare inner carina.

Genotype : *Trapezauchen artiscapus*, sp. n.

The form of the prothorax gives this genus a characteristic facies. A second species is known, also from Tonkin.

*Trapezauchen artiscapus*, sp. n.

♂♀. Derm black, with uniform dense pale green scaling throughout.

*Head* with the frons flattened or shallowly depressed, its width greater than the length of an eye (4 : 3), with a

short median stria. *Rostrum* parallel-sided in the basal half, strongly dilated at the genæ; dorsal area rather deeply impressed, with a fine low median carina. *Antennæ* with the strongly curved scape dilated and compressed, the upper surface being flat and coarsely punctate; funicle with joint 2 much longer than 1, 3 somewhat longer than 4, 4-7 subequal, longer than broad. *Prothorax* with the apex about two-thirds the width of the base, the median part of the disk very convex transversely in front owing to a broad shallow compression on each side, the strong close punctures partly visible through the scales. *Elytra* oblong-ovate, slightly wider in the ♀ but not dilated behind middle; the shallow striae with scaling between the punctures, which are themselves bare; the intervals flat, with numerous short clavate recumbent grey setæ. *Legs* black or piceous, with green scaling.

*Length* 4.5-5.5 mm., *breadth* 2.0-2.5 mm.

TONKIN: Hanoi, 5 ♂, 6 ♀, iii. 1917 (*R. Vitalis*).

DRYMOPHÆTUS, gen. nov.

*Head* with the frons on a level with the eyes and its width not greater than the length of an eye, the carinae on the rostrum ascending the frons; eyes very large, as long as the space between eye and antenna, only slightly convex. *Rostrum* slightly broader than long, distinctly narrower at its base than the head, strongly dilated at the genæ, its lower surface as long or almost as long as the buccal aperture and nearly parallel with the upper surface; dorso-lateral carinae parallel in the basal half, curving strongly outwards at apex, without a transverse carina behind the epistome; lateral areas with an oblique curved carina delimiting the scrobe and running towards the middle of the eye; epistome with its carinate margin forming a sharp acute angle that extends behind the antennæ; mentum with two setæ. *Antennæ* with the regularly curved scape cylindrical, gradually widening from base to apex, with recumbent setæ; funicle with joint 2 longer than 1, rarely equal. *Prothorax* transverse, almost parallel-sided in the basal half, broadly but shallowly constricted at apex, with rather feeble post-ocular lobes, the base deeply bisinuate, its median lobe rounded. *Elytra* much wider at the shoulders than the base of the prothorax, jointly rounded at apex. *Legs*

with a sharp femoral tooth; front tibiæ sinuate at the base, corbels of hind pair with a bare inner carina.

Genotype: *Corigetus saturatevirens* Boh. (*Mylocerus*).

The following species of *Corigetus* from Java and Sumatra are also referable to this genus:—*papuanus* Fst., *albizziæ* Mshl., and *enganensis* Mshl., as well as *Cyphicerus chrysideus* Pasc. (*Mylocerus*) from Queensland, and several undescribed species besides.

#### THALPONOMUS, gen. nov.

*Head* with the frons continuous with the rostrum, on a level with the upper margins of the eyes, its width less than the length of an eye; eyes large, nearly round, only slightly convex. *Rostrum* about as long as broad, narrower at the base than the head, strongly dilated at the genæ, the lower surface nearly parallel with the upper one; dorso-lateral carinæ parallel in the basal half, curving outwards apically; lateral areas without an oblique curved carina; epistome with its carinate margin forming a blunt acute angle, which is raised above the level of the dorsal area; mentum with two setæ. *Antennæ* with the scape gradually clavate distally, with recumbent setæ; funicle with joint 2 longer than 1. *Prothorax* transverse, narrower at apex than at the deeply bisinuate base, the postocular lobes moderate. *Elytra* broader than the prothorax at the obliquely rounded shoulders, very slightly wider behind middle in both sexes, jointly rounded at apex. *Legs* with a small triangular femoral tooth; front tibiæ sinuate at the base, corbels of hind pair with a bare inner carina.

Genotype: *Thalponomus subvittatus*, sp. n.

The Indo-Chinese *Phytoscapus setosus* Aur. is provisionally included in this genus, because it seems out of place in *Phytoscapus* (despite its long rostrum) owing to its acuminate epistome and the deeply bisinuate base of the prothorax.

#### *Thalponomus subvittatus*, sp. n.

♂♀. Derm piceous, with greenish scaling; pronotum with a broad dark stripe on each side; each elytron also with a broad dark stripe which varies greatly in width and is usually more or less mottled with greenish scales:



underside with the scaling greenish at the sides and grey in the middle.

*Head* with the frons flat or very shallowly depressed in the middle, its width three-fourths the length of an eye, with a fine median stria and shortly invaded by the median carina of the rostrum. *Rostrum* as long as broad in ♂, slightly shorter in ♀, very gradually narrowing from base to antennæ, broadly dilated at the genæ; dorsal area broadly impressed anteriorly, with a fine low median carina. *Antennæ* piceous, with the scape coarsely striolate. *Prothorax* transverse (3:4), gently rounded laterally, widest at about the middle, with close strong punctures which are almost obscured by scaling except in the dark stripes and with a shallow round impression on each side near the base. *Elytra* with the dorsal outline gently convex, highest a little behind middle, slightly flattened near the suture on the basal half; the shallow striae with strong punctures and partly invaded by scaling, but the punctures showing through bare and conspicuous; the intervals broad and slightly convex, with a row of minute granules, each bearing a short erect seta, the scales on the dark stripes mostly sparser and much reduced in size. *Legs* piceous, with patches of pale green scales; femora with a sparse row of erect setæ on the lower surface.

*Length* 5-6 mm., breadth 2.0-2.5 mm.

S.W. SUMATRA: Engano I., 7 ♂, 10 ♀ (W. Doherty).

#### HYPENEPHORUS, gen. nov.

*Head* with the frons very broad, its width more than twice the length of an eye, strongly convex transversely; eyes small, broadly ovate, with the narrower end behind, only moderately convex. *Rostrum* somewhat transverse, very broad, its sides forming a continuous line with those of the head, gradually narrowing to the antennæ, slightly widening at the genæ, its lower surface much shorter than the buccal aperture; dorso-lateral carinae (somewhat obscured by scaling) diverging from base to apex, lateral areas without any curved oblique carina behind the scrobe; the strongly carinate margin of the epistome forming a sharp acute angle that extends behind the antennæ, the setæ overhanging it stouter and denser than usual; mentum with two setæ. *Antennæ* with the scape

almost straight, comparatively slender, cylindrical, feebly clavate, reaching middle of prothorax, with recumbent setæ; funicle with joints 1 and 2 equal, or with 2 slightly longer, distal joints elongate. *Prothorax* transverse, widest at or near base (there being sometimes a sharp projecting tooth close to base), rapidly narrowing to apex with a slight curve, not constricted at apex, with strong postocular lobes, the base deeply bisinuate. *Elytra* not much wider than the base of the prothorax, which reaches to stria 6, with sloping shoulders, parallel to beyond middle, separately rounded at apex. *Legs* with a sharp femoral tooth; front tibiæ angulate behind middle on the lower edge, corbels of hind pair with a bare inner carina.

Genotype: *Peltotrachelus albus* Pasc.

Closely related to *Peltotrachelus* Mshl., but the latter genus, in addition to having no bare inner carina in the corbels of the hind tibiæ, differs also in the following characters: the dorso-lateral carinæ on the rostrum are parallel or slightly divergent towards the base, and immediately adjoining them externally is a deep longitudinal sulcus from the scrobe to the eye; the fifth ventrite has in each basal angle a small tubercular prominence; and the eyes are differently shaped, narrowing downwards to a point anteriorly.

#### HACKERIA Lea.

This genus (Mem. Soc. Ent. Belg. xviii. 1911, p. 67) has been omitted from Junk's Catalogue. It was based on a single species, *H. viridivaria* Lea, from Queensland, and Lea placed it in the Otiorrhynchinæ, near *Mylocerus*; but it has well-developed postocular lobes and certainly belongs to the Eremninae.

It appears to have a wide range, because *Cyphicerus schönfeldti* Fst. and *bohemani* Reitt. from China, and *C. farinosus* Fst. from Indo-China, are referable to it, and other undescribed species are known from India, Burma, Siam and Flores I.

#### HEMERUS, gen. nov.

*Head* with the frons on a level with the upper margin of the eyes, its width 1.3 times to nearly twice the length

of an eye; eyes nearly round, convex. *Rostrum* transverse, as wide at the base as the head, feebly dilated at the genæ, the lower surface short and not parallel with the upper surface; dorso-lateral carinæ parallel in basal half, curving outwards at apex, without a transverse carina behind the epistome; lateral areas with no oblique carina; epistome with its carinate margin forming a sharp acute angle that extends behind the antennæ; mentum with two setæ. *Antennæ* with the scape slender, cylindrical, very gradually widening apically, with recumbent setæ; funicle with joint 1 longer than 2. *Prothorax* transverse, trapezoidal, much wider at base than at apex, the base deeply bisinuate, with its median lobe rounded and its angles acute and extending to stria 6 on the elytra, without postocular lobes. *Elytra* with the narrow shoulders sloping, jointly rounded at apex. *Legs* with a very small femoral tooth; front tibiæ not sinuate at base, corbels of hind pair open.

Genotype: *Hemerus virens*, sp. n.

A monotypic genus.

*Hemerus virens*, sp. n.

♂♀. Derm red-brown, with uniform dense pale green scaling above; underside with a broad median stripe of brown scales down the middle and green scales laterally.

*Head* with the frons very broad in ♀, its width nearly twice the length of an eye; in ♂, shallowly concave, its width 1.3 times the length of an eye. *Rostrum* very gradually narrowing from base to antennæ and slightly dilated at the genæ; dorsal area broadly impressed, with a fine low median carina. *Prothorax* with the apical third very shallowly constricted laterally, slightly flattened in the middle of the disk, but with the median basal lobe somewhat turned upwards; the strong separated punctures not visible through the scaling. *Elytra* subparallel in ♂, wider behind middle in ♀; the shallow striae with the strong close punctures almost entirely concealed by the scaling or reduced to a narrow line; the broad flat intervals with numerous very short appressed setæ. *Legs* red-brown, with dense pale green scales.

*Length* 4–5 mm., *breadth* 1.5–2.0 mm.

INDIA: 1 ♀ (*Stevens*); N.W. India, 1 ♂, 1884; United Provinces, Fyzabad, 1 ♀, 1923 (*Major H. W. G. Hingston*);

Bengal, Chota Nagpur, 1 ♂, 2 ♀ (*P. Cardon*); Madras, Vizagapatam dist., Chipurupalle, 1 ♀, 1923 (*R. S. Patuck*—type).

ORCHOBITUS, gen. nov.

*Head* with the frons wider than the length of an eye, flat, on a level with the upper edge of the eyes, which are almost round and moderately convex. *Rostrum* a little broader than long, nearly as wide at the base as the head, moderately dilated at the genæ, the lower surface short but almost parallel with the upper one; dorso-lateral carinæ parallel in the basal half, curving outwards at apex, without any transverse carina behind the epistome; lateral areas without an oblique curved carina; epistome with its carinate margin forming an acute angle that extends somewhat behind the antennæ; mentum with two setæ. *Antennæ* very long and slender; scape cylindrical, gradually clavate at apex, with recumbent setæ; funicle with joint 2 equal to or longer than 1. *Prothorax* with the base not or only slightly wider than the apex, truncate or feebly bisinuate, its angles rectangular and extending only to stria 5 on the elytra, very shallowly constricted at apex, without postocular lobes. *Elytra* much wider at the somewhat oblique or roundly rectangular shoulders than the prothorax, parallel to beyond middle in both sexes, separately rounded at apex. *Legs* with a very small femoral tooth; front tibiæ not sinuate at base, corbels of hind pair open.

Genotype: *Orchobius nudiscutellatus*, sp. n.

Two other undescribed Indian species are known.

*Orchobius nudiscutellatus*, sp. n.

♂♀. Derm red-brown, with dense uniform grey scaling, sometimes with a slight brassy reflection.

*Head* with the frons wider than the length of an eye (5 : 4 in ♂, 6 : 4 in ♀), flat in ♂, shallowly impressed in ♀, with a short median stria. *Rostrum* almost parallel-sided in the basal half, moderately dilated at the genæ; dorsal area as wide as the frons, rather sharply tricarinate, shallowly impressed anteriorly. *Antennæ* with joint 2 of the funicle much longer than 1. *Prothorax* widest at the middle and there feebly rounded laterally, the shallowly bisinuate base a little wider than the apex;

the close coarse punctures almost entirely concealed by scaling. *Scutellum* oblong, entirely bare. *Elytra* with the shoulders somewhat oblique; the shallow striae may be almost entirely concealed by scaling, or the punctures may be narrowly visible; the broad flat intervals with numerous very short recumbent setae. *Legs* red-brown with dense grey scaling.

*Length* 6.5–8.5 mm., *breadth* 2.6–3.5 mm.

S. INDIA: Nilgiri Hills, 1 ♂, 1 ♀ (*H. L. Andrewes*—type); Anamalai Hills, 1 ♀.

PHOLICERUS, gen. nov.

*Head* with the frons on a level with the upper margin of the eyes, its width much less than the length of an eye; eyes very large, almost round and nearly flat. *Rostrum* narrower than the head, parallel-sided in the basal half, strongly dilated at the genae, the lower surface short and not parallel with the upperside; the dorsal area at its base as broad as the frons, the lateral carinae converging from base to middle then curving strongly outwards, with a low transverse ridge behind the epistome; lateral areas broad and even; epistome with its carinate margin forming a narrow acute angle; mentum with two setae. *Antennae* stout, densely squamose throughout; scape cylindrical, gradually clavate at apex, with appressed setae; funicle with joints 1 and 2 equal, the distal ones not or but slightly longer than broad. *Prothorax* with the shallowly bisinuate base somewhat wider than the apex, rounded laterally, without postocular lobes but with sparse vibrissae. *Elytra* much wider at the roundly rectangular shoulders than the prothorax, separately rounded at apex. *Legs* with a small femoral tooth; front tibiae distinctly sinuate at base, corbels of hind pair open.

Genotype: *Pholicerus vigilax*, sp. n.

*Pholicerus vigilax*, sp. n.

♀. *Derm* black, with dense brown scaling and whitish markings; head and rostrum whitish or grey; pronotum pale brown with a narrow median whitish line; elytra pale brown, with a somewhat oblique broad whitish band from stria 1 to the lateral margin which widens outwardly, adjoining this in front a narrower dark brown band or a

macular dark area, behind the whitish band a broader dark brown one, and the posterior declivity mostly whitish with a few brown spots; underside uniformly grey or sandy.

*Head* with the frons comparatively narrow, quite flat, the margins adjoining the eyes narrowly raised, with a short median stria. *Rostrum* nearly as long as broad, the dorsal area at its base as wide as the frons but narrowing to the middle, rather deeply depressed and densely squamose as far as the transverse ridge with a fine low median carina, almost bare between the ridge and the epistome. *Prothorax* transverse (3 : 4), rounded laterally, widest at middle, not constricted at apex; dorsum somewhat convex longitudinally, with dense overlapping scales, the punctures indicated by a very short appressed spatulate seta. *Scutellum* rather large, shield-shaped, with dense whitish or pale brown scales. *Elytra* parallel to beyond middle, the impressed striae partly covered by scaling, the large punctures clearly visible and each containing a broad scale-like seta; the intervals convex, with a single row of short stout recumbent setae. *Legs* entirely covered with dense grey or sandy scales.

*Length* 4.5–6.5 mm., *breadth* 2–3 mm.

BURMA: Ruby Mines, 1 ♀ (*W. Doherty*—type); Tharrawaddy, 1 ♀.

**XLIII.**—*Three new Acanthocephala from Marine Fishes of Australasia.* By H. A. BAYLIS, M.A., D.Sc., Department of Zoology, British Museum (Natural History).

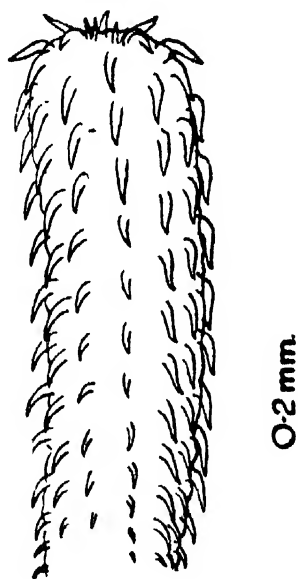
THE three species described in this paper are based on material in two collections of *Acanthocephala* sent to the writer for determination. One of these is part of the helminthological collection of the former Australian Institute of Tropical Medicine, Townsville, North Queensland, now belonging to the School of Public Health and Tropical Medicine, Sydney. The other is part of a collection of parasitic worms from fishes made in Otago Harbour, New Zealand, by Mr. D. H. Graham.

The type-specimens will be deposited in the British Museum (Natural History), and co-types of *Acanthocephalus hastæ* also in the collection at Sydney.

*Acanthocephalus hastæ*, sp. n. (Fig. 1.)

The material examined consists of (a) two males and one female from the intestine and cæca of the javelin-fish or grunter (*Pomadasys hasta*), collected at Cleveland Bay, Queensland, in September, 1913, by Dr. W. Nicoll; (b) two males and two females, in poor condition, obtained from the same host and locality in September, 1915; (c) one male and three females from a "grunter," collected at Townsville, Queensland, by Dr. P. A. Maplestone in September, 1920; (d) four males and four females from

Fig. 1.

*Acanthocephalus hastæ*. Proboscis of female; lateral view.

the "body-cavity" of a sea-bream (*Sparus berda*), Townsville, November, 1920 (Dr. Maplestone); (e) three females from the "body-cavity" of the same host, Australia; (f) two males and one female from the intestine of *Trichurus declivis*, Australia. The last two sets of material were also collected by Dr. Maplestone in November, 1920, and the locality was presumably also Townsville. Sets (c) and (d) are the specimens recorded as *Echinorhynchus truttæ* Schrank by Southwell and Macfie (1925, p. 180), while sets (e) and (f) were determined

by the same authors (*ibid.*, p. 179) as *Echinorhynchus clavula* Duj. These specimens are the property of the Liverpool School of Tropical Medicine, and the writer is greatly indebted to Prof. D. B. Blacklock for the loan of them for comparison. The specimens in sets (*e*) and (*f*) have lost all the hooks from their proboscides, but the sockets can be plainly seen, and in all other respects they agree with the rest of the material. Johnston and Deland (1929, p. 152) have questioned the correctness of Southwell and Macfie's determinations of these specimens, and suggested the possibility of misplacement of the host-labels in the cases of (*d*) and (*e*). There is no doubt, however, that the determinations were erroneous, as the number of rows of hooks on the proboscis is sufficient to show (in *Echinorhynchus truttae* there are 20-22 rows, in *E. clavula* 18).

The following are the main characters of *A. hasta* :—

Body without spines. Proboscis cylindrical or very slightly clavate, with 12 longitudinal rows of about 14 hooks. Hooks in ventral rows rather stouter than dorsal hooks, and of somewhat different shape, with the tip slightly curved outwards. Ganglion and retinacula at posterior end of proboscis-sac, the retinacula inserted in the body-wall almost opposite to the extremity of the sac. Lemnisci very variable in length, sometimes straight and of about the same length as the proboscis-sac, or occasionally extending somewhat behind it, but sometimes much elongated and thrown into antero-posterior loops which do not pass beyond the end of the sac.

*Male*.—Length of body 4-8 mm.; greatest thickness 0.66-1 mm. Length of proboscis 0.7-1 mm.; thickness 0.17-0.21 mm. Length of hooks anteriorly about 0.06 mm., decreasing gradually posteriorly to about 0.02 mm. Length of proboscis-sac 0.95-1.6 mm.; width 0.21-0.32 mm. Testes tandem and usually contiguous, in middle region of body. In well-extended specimens the anterior testis may be separated by some distance from the end of the proboscis-sac; in contracted specimens it may be contiguous with it or even overlap it. Length of each testis 0.44-1.2 mm.; width 0.3-0.7 mm. In mature specimens the anterior testis tends to be slightly larger than the posterior. Cement-glands six, large and pyriform, arranged in two longitudinal series of three, beginning immediately behind the posterior testis.



*Female*.—Length of body 6–12 mm. ; greatest thickness 0.6–1.6 mm. Length of proboscis 0.7–1.4 mm. ; thickness 0.16–0.25 mm. Length of hooks anteriorly up to 0.06 mm. in small specimens, or 0.08 mm. in large specimens, decreasing gradually posteriorly to about 0.02 or 0.03 mm. Length of proboscis-sac 1.7–2.2 mm. ; width 0.24–0.3 mm. Combined length of vagina, uterus and uterine bell about 0.9–1.7 mm. Vaginal funnel about 0.15–0.18 mm. long and 0.09–0.14 mm. wide. Vaginal bulb about 0.07–0.08 mm. long and 0.1–0.15 mm. wide. Eggs fusiform, with the usual three envelopes, the outer of which measures about 0.066–0.084 × 0.02–0.024 mm. The middle envelope is slightly thickened at the poles, but without special prolongations.

In attempting to determine the systematic position of this species, it has been necessary to examine the status of the genera included by Meyer (1931, 1932) in the subfamily Echinorhynchinae. These are *Echinorhynchus* Zoega, in Müller, 1776 ; *Acanthocephalus* Koelreuter, 1771 ; and *Acanthocephaloides* Meyer, 1931 (defined 1932). According to the diagnoses given for these genera by Meyer (1932), *Echinorhynchus* differs from the other two in having the nerve-ganglion situated towards the middle of the proboscis-sac, instead of at its posterior end. If, however, the diagnosis of *Acanthocephaloides* be compared with that of *Acanthocephalus*, it appears that the only real difference between these genera is that in the former the posterior hooks of the proboscis are said to become suddenly smaller than the more anterior hooks, while in *Acanthocephalus* (though this is not clearly stated) the decrease in the size of the hooks posteriorly is gradual. This, in the writer's view, is a very unsatisfactory character, and hardly sufficient to justify the erection of the genus *Acanthocephaloides*. Moreover, although it may hold good for the species originally included in the genus by Meyer, this feature does not seem to be very well marked in some of the species assigned to it more recently by other authors.

The present species has been compared with the descriptions of 23 possibly valid species of *Acanthocephalus* and six species that have been assigned to *Acanthocephaloides*. It does not agree exactly with any

of them in the number of hooks on the proboscis. In a number of species there are 12 longitudinal rows of hooks, or the number of rows is variable and may be 12. In these species, however, with one possible exception, the number of hooks per row is either less or more than 14. In most of them it is less than 10, but in one (*Acanthocephaloides japonicus*) it is 25. The possible exception referred to is *Acanthocephalus kashmirensis* Datta, 1936. This species is described as having "13-18 rows of 6-8 hooks each," but this seems to mean transverse and not longitudinal rows, since the accompanying figure indicates that there are in reality 11 or 12 longitudinal rows (of which 6 are actually shown) of 13 or 14 hooks each. Apart from other differences, however, the hooks are apparently much larger than in *A. hastæ*, and the host of Datta's species is a freshwater fish from Indian Tibet, so that the species is very unlikely to be identical with one from Australian marine fishes.

*Rhadinorhynchus peltorhamphi*, sp. n. (Fig. 2.)

The material examined consists of (a) four males and one female from the "common sole" of New Zealand (*Peltorhamphus novæ-zelandiæ*), collected by Mr. D. H. Graham, presumably in Otago Harbour, New Zealand, on 28 Aug. 1931; (b) a considerable number of specimens of both sexes obtained by the same collector from "baby E. Soles" [? the same host-species] in 19 fathoms on 9 Oct. 1931.

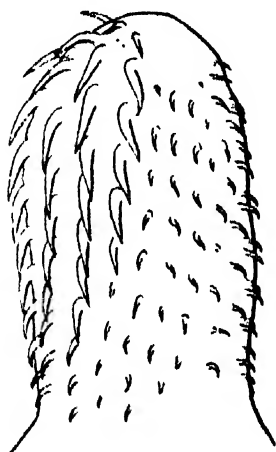
The following are the main characters of the species:—

Body without spines. Proboscis cylindrical or slightly clavate, with 12-18 longitudinal rows of 9-11 hooks. Hooks of 6-10 ventral rows enormously larger than those of the other rows. Retinacula [and ganglion?] at posterior end of proboscis-sac. Lemnisci variable in length (sometimes shorter, sometimes longer than proboscis-sac); when contracted, somewhat club-shaped or flattened and expanded at their free ends.

*Male*.—Length of body 2.5-8 mm.; greatest thickness 0.55-1.4 mm. Length of proboscis 0.3-0.6 mm.; thickness 0.12-0.2 mm. Length of largest hooks about 0.1 mm.; smallest hooks about 0.028 mm. Length of proboscis-sac 0.45-0.9 mm. (1 mm. in an extended

specimen); width 0.12-0.26 mm. Testes tandem, usually contiguous and close behind proboscis-sac; varying greatly in shape according to contraction of specimens. In contracted specimens they are subglobular and each measures about  $0.5-0.8 \times 0.35-0.7$  mm. In an extended specimen they are elongate, the anterior testis measuring  $1.2 \times 0.56$  mm., the posterior  $1.55 \times 0.45$  mm. Cement-glands apparently 6, large and pyriform. In most specimens they are very crowded, owing to contraction of the body, but when the body is extended they appear to be arranged in two longitudinal rows of three.

Fig. 2.



*Rhadinorhynchus peltorhamphi*. Proboscis of female; lateral view.

*Female*.—Length of body 2.5-16 mm. (specimens only 3-4 mm. long already contain eggs); greatest thickness 0.5-1.7 mm. Length of proboscis up to 0.7 mm.; width up to 0.24 mm. Length of largest hooks about 0.1-0.11 mm.; smallest hooks 0.028-0.03 mm. Length of proboscis-sac up to 1.2 mm.; width up to 0.35 mm. Total length of uterine bell, uterus and vagina up to about 3 mm. Uterine bell about 0.5 mm. long. Uterus up to 2.3 mm. long and 0.4 mm. in greatest width. Vagina about 0.3 mm. long and 0.13 mm. in greatest width. Eggs fusiform; outer envelope with rather pointed ends, measuring  $0.092-0.102 \times 0.022-0.024$  mm. Middle envelope with cylindrical or knob-like polar prolongations having rounded extremities.

The systematic position of the species just described presents a somewhat difficult problem. In the classification adopted by Meyer (1932) it would fall naturally into the family Rhadinorhynchidæ Travassos. But Van Cleave and Lincicome (1940) have divided this group of genera into two families, Rhadinorhynchidæ and a new family, Gorgorhynchidæ. In doing so, they have attached primary importance to the number of cement-glands in the male. Their diagnoses of the two families include no constant distinguishing features except that there are eight cement-glands in the Rhadinorhynchidæ and four in the Gorgorhynchidæ. The present species, therefore, does not fit into either of these families. Yet within them there are several genera or subgenera to which it shows close resemblances, particularly in the absence of spines on the body. If the number of cement-glands be ignored, it runs down as far as *Leptorhynchoides* in the key to genera of Rhadinorhynchidæ given by Van Cleave and Lincicome, while in their key to Gorgorhynchidæ it runs down to *Filisoma*. In *Leptorhynchoides*, however, there are eight cement-glands, the lemnisci are much longer than the proboscis-sac, and the nerve-ganglion is at, or in front of, the middle of the sac. In *Filisoma* the body is elongate, and the male organs are confined to the posterior half. The cement-glands, of which there are apparently four, are very long and tubular. *Rhadiorhynchoides* Fukui and Morisita, 1937, which is assigned by its authors (1938) to the family "Centrorhynchidæ," and is not mentioned by Van Cleave and Lincicome, is treated as a subgenus of *Rhadiorhynchus* by Yamaguti (1939). In this form the proboscis-hooks are not only larger ventrally than dorsally, but also increase in size posteriorly—the opposite of the usual condition in *Rhadiorhynchus* and related forms. The ganglion is in the middle of the proboscis-sac, and there are four cement-glands. In *Neorhadiorhynchus* Yamaguti, 1939 (proposed as a subgenus of *Rhadiorhynchus*), the ganglion is at, or in front of, the middle of the proboscis-sac, and the number of cement-glands is also four.

The question arises whether the number of cement-glands can be regarded as a satisfactory family or generic character in this group. Harada (1938) has described two species of *Micracanthocephalus* (assigned by Van

Cleave and Lincicome to the Gorgorhynchidæ), in one of which (the genotype) there are four cement-glands and in the other six. Yamaguti (1939) erected *Neorhadiorhynchus* as a subgenus of *Rhadiorhynchus*, although it has only four cement-glands, and would therefore fall into the family Gorgorhynchidæ in the system of Van Cleave and Lincicome. It seems, therefore, that the number of cement-glands is unreliable even as a generic character, and certainly should not be used as a distinction between families. In the writer's view, the erection of the family Gorgorhynchidæ was unjustified, and its contents should be restored to the Rhadiorhynchidæ.

With regard to the generic status of the present species, there appear to be three possible courses:—(1) To add a fourth subgenus to the three already included by Yamaguti (1939) in *Rhadiorhynchus*—viz. *Rhadiorhynchus*, *Rhadiorhynchoides* and *Neorhadiorhynchus*; (2) to regard these as genera, and add a new genus for its reception; (3) to return to the older and broader conception of the genus *Rhadiorhynchus*, and abolish subgenera within it. Of these three courses, in view of the very slight characters upon which Yamaguti's subgenera have been erected, the writer prefers the last, and the species is therefore assigned to *Rhadiorhynchus*, *sensu lato*.

*Micracanthocephalus hemirhamphi*, sp. n.

(Figs. 3 & 4.).

The material consists of two males and four females collected by Mr. D. H. Graham from the stomach of a garfish (*Hemirhamphus intermedius*) at Kinnaird's Beach [Otago Harbour, New Zealand] on 18 Dec. 1931.—

The following are the main characters:—

Body with about 15–17 transverse rows of spines in the anterior region, the more posterior rows incomplete dorsally. Proboscis clavate, bent ventrally, with 12 longitudinal rows of 9–11 hooks; the anterior 4–5 hooks of each row very long and slender, without distinction between dorsal and ventral rows. The more anterior hooks have roots similar in form to those described by Harada (1935) for the genotype—i. e. with a posterior process and an asymmetrical anterior process. Ganglion

at about the middle of the proboscis-sac. Lemnisci club-shaped, shorter than proboscis-sac.

*Male*.—Length of body 3–4.3 mm. ; greatest thickness 0.46–0.67 mm. Length of proboscis 0.55 mm. ; greatest width 0.16–0.17 mm. Length of longest hooks 0.09 mm. ; shortest hooks 0.016 mm. Length of proboscis-sac 0.8–0.9 mm. ; width 0.15 mm. Testes contiguous, the anterior immediately behind or overlapping the proboscis-sac. Cement-glands four, club-shaped, parallel. Pos-

Fig. 3.



*Micracanthocephalus hemirhamphi*. Proboscis and anterior portion of body of female ; lateral view.

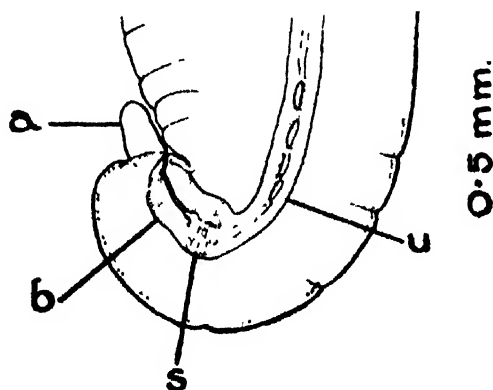
terior end of body bluntly rounded. Genital aperture dorsal.

*Female*.—Length of body 4.5–6.5 mm. ; greatest thickness 0.8–0.97 mm. Length of proboscis 0.55–0.65 mm. ; greatest thickness 0.18–0.2 mm. Length of longest hooks 0.11–0.12 mm. ; shortest hooks 0.016–0.018 mm. Length of proboscis-sac 0.9–1.1 mm. ; width

0.17–0.2 mm. Posterior end of body sharply bent towards the ventral side, forming a hook. Genital aperture ventral. Immediately behind it a blunt finger-like appendage about 0.08–0.1 mm. long. Vagina about 0.15–0.2 mm. long. Diameter of vaginal sphincter about 0.08–0.1 mm. Eggs ellipsoidal, measuring 0.056–0.062  $\times$  0.015–0.016 mm.

Only two species of *Micracanthocephalus*, both from Japanese waters, seem to have been described hitherto. The present species differs from *M. motomurai* (Harada, 1935) in that the genital aperture is dorsal, and not ventral, in the male. The proboscis-hooks attain a

Fig. 4.



*Micracanthocephalus hemirhamphi*. Posterior end of female; lateral view. *a*, caudal appendage; *b*, vaginal bulb; *s*, sphincter; *u*, uterus.

greater number, and the largest of them are larger, than in *M. motomurai*. In *M. dakusensis* Harada, 1938, the male has six cement-glands, and the genital aperture is figured as ventral. The size of the proboscis-hooks is not given, but again they are fewer than in some specimens of *M. hemirhamphi*. There is no mention of a caudal appendage in the female in Harada's description of either species.

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XLIV.—*New Species of Nonarthra (Halticinae, Col.) from Borneo, etc.* By G. E. BRYANT, F.R.E.S., Imperial Institute of Entomology.

THE genus *Nonarthra* has a range from Corea to North Queensland. In India 10 species; China, Japan and Corea, 9; Borneo, Penang and Sumatra, 11; Philippine Is., 4; Celebes and Aru, 5; N. Queensland, 2. Up to the present no species has been recorded from Java or New Guinea. I have taken nine species in Sarawak, mostly on flowering jungle trees or creepers, and when their habits are known they will probably be found to be plentiful in the whole Oriental region. Some of the species are very variable, especially the Indian species *N. variabilis* Baly; also *N. thoracica* Baly, from the Philippine Is., ranges from blue to entirely testaceous with varying degrees of blue on the elytra. I append a list of the described species, as there is at present no up-to-date catalogue of the Halticinae. All the types of the new species are in the British Museum (Natural History):—

- Nonarthra albofasciata* Duv.—Ann. Ent. Belg. 1892, xxxvi. p. 424. India.
- Nonarthra apicalis* Jac.—Ann. Mus. Civ. Genoa, xxvii. p. 200, 1889. Burma.



- Nonarthra australis* Baly.—Ent. M. Mag. xiii. 1876, p. 82. Queensland.
- Nonarthra bifasciata* Jac.—Ann. Soc. Belg. xliii. p. 378. Borneo.
- Nonarthra biformis* Wse.—Ark. Zool. xv. No. 12, 1923, p. 115. Queensland.
- Nonarthra birmanica* Jac.—Ann. Mus. Civ. Genoa, xxxii. 1892, p. 935. Burma.
- Nonarthra borneensis*, sp. n. Sarawak.
- Nonarthra celebensis* Jac.—Ann. Mus. Civ. Genoa, 2nd ser. ii. 1885, p. 47. Celebes.
- Nonarthra ceylonensis* Jac.—Proc. Zool. Soc. Lond. 1887, p. 84. Ceylon.
- Nonarthra coreanum* Chujo.—Trans. N. H. Soc. Formosa, xxv. 1935, p. 359. Corea.
- Nonarthra cyanea* Baly.—Trans. Ent. Soc. Lond. 1874, p. 210. Japan.
- Nonarthra dakshina* Mlk.—Fn. Brit. Ind. Col. Chrysom. 1926, p. 121, fig. S. India.
- Nonarthra dhumala* Mlk.—Fn. Brit. Ind. Col. Chrysom. 1926, p. 121, fig. Tenasserim.
- Nonarthra discoidalia* All. (*Acrocrypta*).—N. Arch. Mus. Paris, 1892 (3) iii. p. 233. Chen—Peking; N. H. Bull. vii. pt. 1, 1933, p. 46 (note). Annam.
- Nonarthra flava*, sp. n. Sarawak.
- Nonarthra flavicollis* Jac.—Ann. Soc. Belg. xlii. p. 378. Borneo.
- Nonarthra formosense* Chujo.—Trans. N. H. Soc. Formosa, xxv. 1935, p. 360. Formosa.
- Nonarthra fulva* Baly.—Trans. Ent. Soc. Lond. 1874, p. 211. Japan.
- Nonarthra fulventris* Baly.—Ent. M. Mag. xiii. 1876, p. 82. Menado.
- Nonarthra lævipennis* Jac.—Ann. Mus. Civ. Gen. 2nd series. ii. 1885, p. 47. Aru I.
- Nonarthra limbata* Baly.—Ent. M. Mag. xiii. 1876, p. 82. Tondano.
- Nonarthra limbutipennis* Jac.—Ann. Mus. Civ. Genoa, xxxii. 1892, p. 935. Burma.
- Nonarthra marginicollis*, sp. n. Sarawak.
- Nonarthra neglecta* Wse.—Phil. Jour. Sci. D, viii. 1913, p. 237. Philippine Is.
- Nonarthra nigra* Jac.—Ann. Mus. Civ. Genoa, xxxvii. 1896, p. 137. Mentawai I.

- Nonarthra nigriceps* Wse.—Hor. Ent. Ross, 1889, xxiii. p. 642. China.
- Nonarthra nigricolle* Wse.—Hor. Ent. Ross, 1889, xxiii. p. 641. China.
- Nonarthra nigrolineata*, sp. n. Sarawak.
- Nonarthra nigromarginata*, sp. n. Sarawak.
- Nonarthra nigrosiginata*, sp. n. Celebes.
- Nonarthra ornata* Baly.—Journ. of Ent. i. 1862, p. 456. Penang.
- Nonarthra ovata*, sp. n. Sarawak.
- Nonarthra patkaia* Mlk.—Fn. Brit. Ind. Col. Chrysom. 1926, p. 119, fig. Assam.
- Nonarthra postfasciata* Fairm. (*Amphimela*).—Ann. Soc. Ent. Fr. 1889 (6) ix. p. 73. Chen—Peking; N. H. Bull. viii. pt. 1, 1933, p. 46 (note). Moupin.
- Nonarthra pulchrum* Chen. Trans. Sci. Soc. China, viii. 1934, p. 65, fig. E. China.
- Nonarthra quadriplagiata*, sp. n. Philippine Is.
- Nonarthra ruficollis*, sp. n. Celebes.
- Nonarthra scutellata* Jac.—Mém. Soc. Ent. Belg. vii. 1900, p. 126. India.
- Nonarthra sumatrensis* Har.—Stett. Zeit. 1876, p. 233. Sumatra.
- Nonarthra thoracica* Baly.—Ent. M. Mag. xiii. 1876, p. 82. Manilla.
- Nonarthra tibialis* Jac.—Proc. Zool. Soc. Lond. 1885, p. 740. Japan.
- Nonarthra variabilis* Baly.—Journ. of Ent. i. 1862, p. 456, t. 21, fig. 1. India.

*Nonarthra nigromarginata*, sp. n. (Fig. 1.)

Ovate, black, with the side-margins of the prothorax pale brown, the elytra with the central portion and the basal half of the side-margins pale brown, surrounded with a broad black band, the suture narrowly black, very finely and closely punctured.

Length 3 mm.

Head black, nitid, impunctate. Antennæ short, the four basal segments fulvous, the five apical segments black and strongly dilated and flattened. Prothorax transverse, black, with the side-margins narrowly bordered with pale brown, the anterior angles slightly produced and rounded, the surface nitid and impunctate. Scutel-

lum black, triangular impunctate. Elytra with the sides rounded, widest just behind the middle, narrowly margined, the basal half narrowly pale brown, and inside this a broad black band enclosing a pale central portion, the suture narrowly black, very closely and finely punctured. Legs with the femora black, the tibiae and tarsi fuscous. Underside black.

W. SARAWAK : Quop, iii.-iv. 1914 (*G. E. Bryant*), 1 specimen.

Allied to *N. marginicollis* Bry., and differs chiefly in the colour of the elytra.

*Nonarthra ruficollis*, sp. n. (Fig. 2.)

Rounded, contracted in front, the head and prothorax rufous, the elytra black, very finely and closely punctured, the punctures being slightly stronger near the side-margin.

Length 3 mm.

Head rufous, impunctate. Antennae short, extending slightly beyond the base of the prothorax, rufous the four basal segments slender, the five apical segments dilated and flattened. Prothorax transverse, the sides rounded and much contracted in front, rufous, impunctate, the anterior angles slightly produced and rounded. Scutellum black, triangular, impunctate. Elytra black, broadly rounded, the base wider than the base of the prothorax, very finely and closely punctured, nitid, the punctures near the side-margins slightly stronger. Legs flavous, with the exception of the hind femora which are fuscous. Underside with the pro- and mesosternum rufous, the remainder fuscous.

CELEBES : Macassar (Baly Collection, British Museum). Collected by A. R. Wallace.

Allied to *N. celebensis* Jac., but differs chiefly in the colour of the head and prothorax.

*Nonarthra flava*, sp. n. (Fig. 3.)

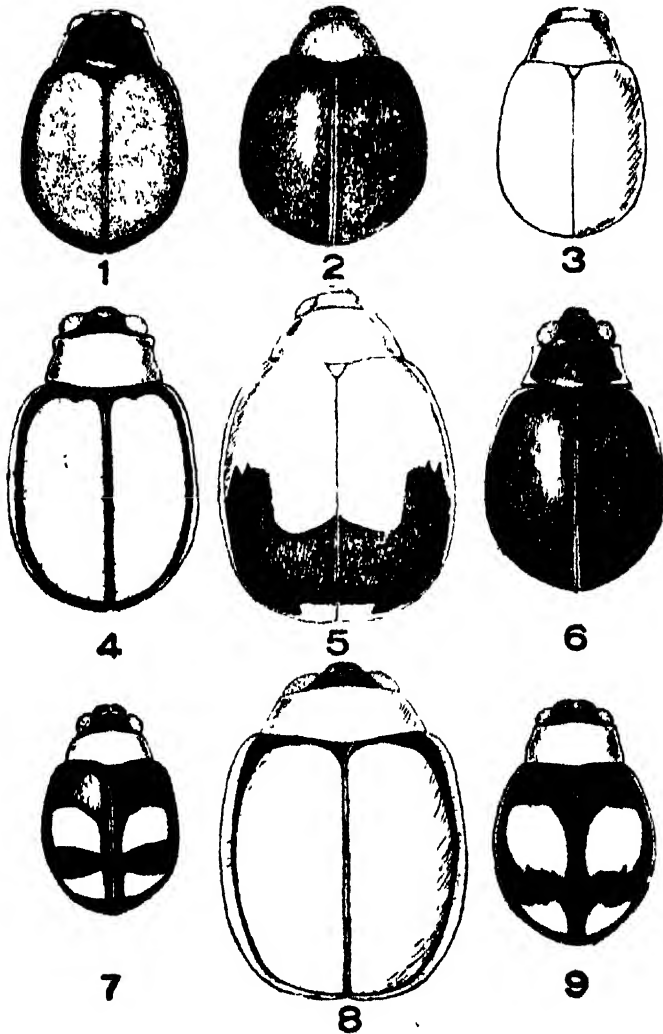
Ovate, entirely flavous, with the exception of the five apical segments of the antennae black, and the hind femora tinged with fuscous, head and prothorax impunctate, the elytra very finely and closely punctured.

Length 3 mm.

♂♀.—Head flavous, nitid, impunctate. Antennae extending beyond the base of the prothorax, the four basal segments flavous, the fourth with the apical portion

black, the five apical segments black, broad and flattened, clothed with fine white short pubescence. Prothorax flavous, transverse, the sides contracted in front, and

Figs. 1-9.



- |   |  |
|---|--|
| 1. <i>Nonarthra nigromarginata</i> , sp. n. | 6. <i>Nonarthra marginicollis</i> , sp. n. |
| 2. " <i>ruficollis</i> , sp. n.             | 7. " <i>borneensis</i> , sp. n.            |
| 3. " <i>flava</i> , sp. n.                  | 8. " <i>ovata</i> , sp. n.                 |
| 4. " <i>nigrolineata</i> , sp. n.           | 9. " <i>quadriplagiata</i> , sp. n.        |
| 5. " <i>nigrosignata</i> , sp. n.           |  |

narrowly margined, nitid and impunctate. Scutellum flavous, impunctate, triangular. Elytra flavous, very finely and closely punctured, the sides slightly rounded, and narrowly margined. Legs flavous, the hind femora

tinged with fuscous. Underside clothed with very fine short pubescence, the first ventral segment of the abdomen the longest.

W. SARAWAK : Mt. Matang, 6. ii. 1914, 1000 ft. (*G. E. Bryant*), 7 specimens. (Holotype) ; xii. 1913–ii. 1914 (*G. E. Bryant*), 7 specimens ; Quop, iv. 1914 (*G. E. Bryant*), 2 specimens. On a white flowering creeper, No. 2.

Allied to *A. variabilis* Baly, the unmarked variety, but smaller and narrower and less rounded.

*Nonarthra nigrolineata*, sp. n. (Fig. 4.)

Flavous, with the meso- and metasternum, head, and six apical segments of the antennæ black, elytra with a broad black line inside the side-margins, and the suture black. Legs with the apical half of the femora black.

Length 3.5–4 mm.

♂♀.—Head black, nitid, impunctate, the frontal half tinged with fulvous, clothed with scattered pale pubescence. Antennæ extending well beyond the base of the prothorax, the three basal segments flavous, the apical portion of each fuscous, the six apical segments black, broad and flattened, clothed with fine pubescence. Prothorax flavous, transverse, nitid, impunctate, the sides broadly margined, with the anterior angles produced and rounded. Scutellum black, triangular, impunctate. Elytra with the sides almost parallel, rounded at the apex, flavous, a black line running parallel with the side-margins, the suture and base black, the sides strongly margined, the surface finely and not very closely punctured. Legs flavous, the hind femora with the apical half black, and all the tarsi tinged with fuscous, the hind tibiæ with a row of fine black teeth on the outer apical half. Underside with meso- and metasternum black, the ventral segments of the abdomen flavous. ♀ slightly larger.

W. SARAWAK : Quop. iii. and iv. 1914 (*G. E. Bryant*), 2 specimens.

Allied to *N. bifasciata* Jac., from Borneo, but larger, and pattern of elytra different.

*Nonarthra nigrosignata*, sp. n. (Fig. 5.)

Ovate, contracted in front, flavous, with a broad black band near the apex of the elytra, produced at the side-margins to about the middle, the five apical segments of the antennæ tinged with fuscous.

Length 5 mm.

Head flavous, nitid, impunctate, the labrum black, rather narrow, about as broad as the front margins of the prothorax, the eyes not prominent. Antennæ short, extending just beyond the base of the prothorax, the four basal segments flavous, the remaining five tinged with fuscous, more dilated and flattened. Prothorax flavous, transverse, the sides strongly contracted in front, impunctate. Scutellum flavous, triangular, impunctate. Elytra much wider than the base of the prothorax, the sides strongly rounded, the sides margined, flavous, with a broad black transverse band on the apical third not reaching the apex, and at the side-margin extending back to the middle, but not touching the side-margin, very finely and closely punctured. Legs flavous, the posterior femora with the apical half black. Underside flavous, clothed with very short and fine golden pubescence, the first ventral segment of the abdomen the longest, the second slightly shorter, and the third still shorter.

CELEBES : Latimodjong (Geb, viii. 1930 (*S. Heinrich*), 1 specimen.

Allied to *N. limbata* Baly, from Tondano, in size and shape, but differs in the pattern of the elytra.

*Nonarthra marginicollis*, sp. n. (Fig. 6.)

Ovate, black, with the exception of three basal segments of the antennæ and the basal portion of the tibiæ fulvous, the prothorax with the side-margins flavous, the basal half of the elytra with the side margin narrowly flavous.

Length 3 mm.

♂♀.—Head black, nitid, impunctate. Antennæ short, extending just beyond the base of the prothorax, the three basal segments fulvous, tinged with fuscous above, the six apical segments black, dilated and flattened, the sixth to the eighth the broadest, the basal segment slender, about twice as long as the second, the third slightly longer than the second. Prothorax transverse, black, nitid, impunctate, the sides contracted in front, the side-margins narrowly flavous and margined, the anterior angles produced and rounded. Scutellum black, triangular impunctate. Elytra with the sides slightly rounded, widest behind the middle, black, nitid, the sides narrowly margined, the basal half of the side-margin narrowly flavous. Legs more or less black, with the basal part of the tibiæ fulvous. ♂ with the first segment of the anterior tarsi slightly dilated. Underside black.

W. SARAWAK: Quop, iii. 1914 (*G. E. Bryant*), 13 specimens.

Allied to *N. nigra* Jac., from the Mentawai Is., but differs in being a deep black. Jacoby's type is bronze, and it is slightly larger and more rounded.

*Nonarthra borneensis*, sp. n. (Fig. 7.)

Below fulvous, head black, antennæ with the three basal segments flavous, the remainder black, prothorax ivory-white, elytra black, with four ivory-white patches, and the apex narrowly ivory-white.

Length 3 mm.

Head black, nitid, impunctate, about the same width as the anterior margin of the prothorax, the eyes not very prominent, antennæ extending slightly beyond the base of the prothorax, the three basal segments flavous, the six terminal black, the sixth to the eighth dilated and flattened. Prothorax very transverse, ivory-white, nitid, widest at the base, and the sides contracted in front, the anterior angles slightly rounded. Scutellum black, triangular, impunctate. Elytra with the sides rounded to the apex, broadest just behind the middle, black, with four ivory-white patches, one at the middle and another before the apex, the middle one broadest at the side and narrowed towards the suture, the apical one broadest near the suture and pointed at the side, the apex of the elytra narrowly ivory-white, very finely punctured, the sides narrowly margined. Legs flavous, with the exception of the posterior femora black. Underside fulvous.

W. SARAWAK: Quop, iii. 1914 (*G. E. Bryant*), 1 specimen.

Allied to *N. ornata* Baly, from Penang, but differs in the elytral pattern, the head black, and the prothorax paler.

*Nonarthra ovata*, sp. n. (Fig. 8.)

Ovate, flavous, the head black, the antennæ with the six apical segments black, the elytra with a narrow black line inside the side-margins, and the base and suture narrowly black, the elytra very minutely punctured.

Length 5 mm.

♂. Head black, nitid, very minutely punctured, the labrum fulvous, the eyes not very prominent. Antennæ extending not quite to the middle of the elytra, the three basal segments fulvous, tinged with fuscous, the six apical segments black, more dilated and flattened, the apical

segment with the apex rounded. Prothorax flavous, very transverse, widest at the base, the sides contracted in front. Scutellum triangular, black, margined with fulvous, nitid. Elytra broader at the base than the prothorax, the sides rounded, widest about the middle, flavous, with a narrowly black line inside the side-margins, the sides strongly margined, containing some strong punctures, the base and suture narrowly black, the surface very minutely punctured. Legs flavous, with the apical half of the posterior femora black, all the tarsi tinged with fuscous. Underside fuscous.

W. SARAWAK: Quop, 2. iv. 1914 (*G. B. Bryant*), 2 specimens. On white flowers of jungle tree.

Allied to *N. limbata* Baly, but differs in being rounder and less convex, head black, and pattern of elytra different.

*Nonarthra quadriplagiata*, sp. n. (Fig. 9.)

Flavous, except the head black, with the clypeus and labrum fulvous, the elytra with four flavous patches surrounded with black, the posterior femora and metasternum black.

Length 3 mm.

Head black, nitid, impunctate, the clypeus and labrum fulvous. Antennæ short, extending slightly beyond the base of the elytra, the four basal segments flavous, the five apical segments fulvous, more dilated and pubescent. Prothorax flavous, transverse, the sides contracted in front, impunctate. Scutellum triangular, fulvous, nitid. Elytra with the sides margined and rounded to the apex, widest just behind the middle, very minutely punctured, the pattern forming four flavous patches, one median and another near the apex, surrounded with black, the base broadly black, a transverse black band behind the middle, the sides and suture black, the black portion not touching the side-margins. Legs flavous, with the exception of the posterior femora black. Underside flavous, the metasternum black.

PHILIPPINE IS.: Bohol (*G. C. Semper*; Fry Collection), 5 specimens.

Allied to *N. ornata* Baly, from Penang, but differs in the colour of the head and prothorax, and the pattern on the elytra, and in having the posterior femora black.



On two new Pronocephalid Trematodes

XLV.—Two new Pronocephalid Trematodes.

By STEPHEN PRUDHOE, Department of Zoology  
Museum (Natural History).

THE material of the two species described belongs of the helminthological collection belonging to the Department of Public Health and Tropical Medicine, Sydney. For the opportunity of studying it the writer is indebted to Dr. H. A. Baylis, to whom the collection was sent for determination.

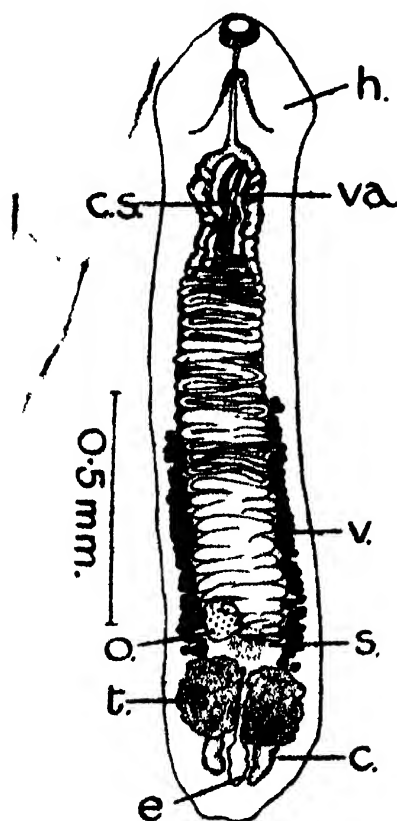
Both species were collected by Dr. A. Breinl from the "stomach" of a hawksbill turtle (*Eretmochelys imbricata*) in the Torres Strait.

*Pleurogonius truncatus*, sp. n. (Fig. 1)

The body is smooth and elongate, slightly flattened ventrally and convex dorsally. It varies between 1.5 and 2.1 mm. in length and between 0.3 mm. and 0.4 mm. in maximum width. The lateral margins of the body are more or less parallel for the greater part of its length and the posterior extremity is, in each of the specimens examined, distinctly truncated—the result of contracted papillae, which are characteristic of some members of the family. The head-collar is represented by two ventral lobes connected posteriorly by a low muscular dorsal ridge, which in some specimens is difficult to detect. On the ventral surface, between the posterior ends and the oral sucker, the lobes of the head-collar in the median line to form an arch-like depression. The subterminal oral sucker measures 0.07 mm. in diameter. The oesophagus extends to about the anterior limit of the collar. The intestinal caeca extend anteriorly and tortuously to the posterior end of the body, where, at the level of the "shell"-gland they turn inwards and over the inner dorsal surfaces of the testes. The excretory pore lies on the postero-dorsal surface of the body between the ends of the caeca. An elongate excretory duct extends anteriorly between the testes to the "shell"-gland, where into it open two vessels which divide the marginal regions of the body. These vessels extend ventrally to the intestinal caeca to about the level of the intestinal bifurcation, where they appear to terminate without uniting. The male and female genital

each other, are displaced to the left of the slightly behind the intestinal bifurcation. Three specimens show the genital pores lying in a depression, which might be called a genital atrium. This feature is, no doubt, an artifact, probably caused by simultaneous contraction of the cirrus-sac and the vagina when the specimens were killed. The

Fig. 1.



*monius truncatus*. Ventral view. c., intestinal caecum; c.s., cirrus-sac; e., excretory vesicle; h., head-collar; o., ovary; s., shell-gland; t., testis; v., vitelline follicles; va., vagina.

muscular cirrus-sac measures 0.17–0.28 mm. in length and 0.037–0.05 mm. in maximum width, and contains a well-developed pars prostatica and an unarmed cirrus. The vesicula seminalis externa forms three or four loops lying dorsally to the uterine coils. The loops are arranged symmetrically in the posterior region of the body, are somewhat lobed, and measure 0.15–0.22 mm.

*Pronocephalid Trematodes from*

in length and 0.1–0.15 mm. in width. The right of the median line, a short distance from the right testis. It is somewhat rounded, 0.06–0.07 mm. in diameter, with smooth or slightly wavy margins. The “shell”-gland is smaller than the testis and lies in the median line immediately in front of the testes. The vitelline follicles are arranged laterally to the intestinal caeca, and extend from the anterior end of the testes to about the middle of the body. The cirrus is disposed in numerous transverse coils, which are situated on the ventral surfaces of the intestinal caeca. The eggs measure 0.022–0.025 × 0.012–0.015 mm., each surrounded by a long slender filament at each pole.

Co-types and paratypes will be deposited in the Museum (Natural History) and in the Sydney Public Health and Tropical Medicine.

According to Mehra (1939), *Glyphicephalus* Linton, 1910, and *Myosaccus* Gilchrist are synonyms of *Pleurogonius* Looss, 1901, but seems to be no reason why this opinion should be accepted with regard to *Glyphicephalus* and *Myosaccus*. The case for the suppression of *Myosaccus* as a synonym of *Pleurogonius* is, however, somewhat doubtful, as there are differences in the structure of the collar. Ventrally the collar of *Pleurogonius* forms two lobes, which are sometimes connected by a low muscular dorsal ridge. The collar of *Myosaccus* is evidently represented by a muscular ridge in the anterior region of the body, and is ventrally absent, although there is said to be a depression on the ventral surface immediately behind the oral sucker, distinguishing *Renigonius* from *Pleurogonius*. The writer considers the absence of ventral lobes on the collar as a generic character. *Myosaccus* seems to the writer to have a closer resemblance to *Pyelosomum* than to *Pleurogonius*, but for the present it is regarded as distinct.

Including the new form, 14 species appear to be assigned to *Pleurogonius*, and they are differentiated by the following key:—

- |   |    |
|---|----|
| 1. Ventral lobes of collar united in median line behind the oral sucker . . . . . | 2. |
| Ventral lobes of collar separated, and extending to oral sucker . . . . .         | 3. |

# phen Prudhoe on two new

arine fishes .....	<i>erubescens</i> (Linton, 1910)*.
helonians .....	3.
025 mm. long .....	4.
034 mm. long .....	6.
adimentary .....	<i>sindhii</i> Mehra, 1939.
bsent .....	5.
stout, about one-quarter of	[1809).
ngth; eggs without filaments†.	<i>trigonocephalus</i> (Rud.,
a slender, about one-eighth	
y-length; eggs with filament at	
pole .....	<i>truncatus</i> , sp. n.
less than 1 mm. in length; eggs	
ut filaments .....	<i>minutissimus</i> Looss, 1901.
3-4 mm. in length; eggs with	
ent at each pole .....	7.
ne follicles relatively large, and	
ber about 18 in each row .....	<i>lobatus</i> Looss, 1901.
ne follicles small and numerous..	<i>solidus</i> Looss, 1901.
ores situated laterally to left	
... ..	<i>chelonii</i> Mehra, 1939.
pores situated between median	
d left caecum .....	9.
constricted at its middle .....	<i>keamari</i> Mehra, 1939.
not constricted .....	10.
ore than 7 mm. in length .....	11.
than 4.5 mm. in length .....	12.
lf the length of cirrus-sac ..	<i>ozakii</i> Oguro, 1936.
long as cirrus-sac .....	<i>longiusculus</i> Looss, 1901.
0.033 mm. long, with fila-	
ach pole .....	<i>linearis</i> Looss, 1901.
mm. long, without filaments.	<i>bilobus</i> Looss, 1901.
mm. long, without filaments.	<i>karachii</i> Mehra, 1939.

## *elosomum parvum*, sp. n. (Fig. 2.)

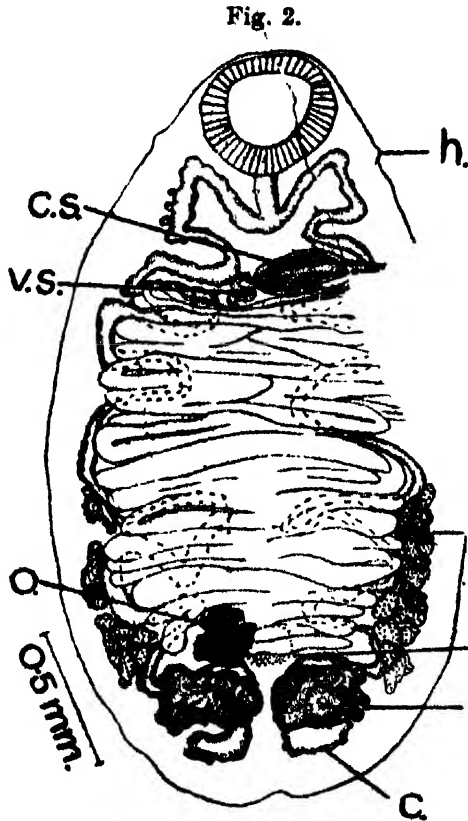
l of this species consists of only two speci-  
 hich is damaged. They measure 2.2 mm.  
 in length and 1.3 mm. and 1.5 mm. in  
 respectively. The body is smooth and  
 he head-collar appears to be represented  
 ular ridge surrounding the body behind  
 sucker. The subterminal oral sucker measures  
 49 mm. in diameter, and leads into a short  
 us. The intestinal caeca undulate transversely  
 six lateral loops on each side of the body. Pos-  
 hey pass over the inner dorsal surfaces of the

robability, the species *Barisomum candidulum* (Linton, 1910)  
*ionius pomacanthi* (MacCallum, 1916) are identical with

h the absence of filaments is used in the key as a dis-  
 character, the writer is of the opinion that a further  
 of the species concerned may possibly reveal the presence  
 at least on the eggs about to be deposited.

*Pronocephalid Trematodes from*

testes. The excretory pore lies dorsally at the anterior end of the body, and opens into an elongate duct extending anteriorly between the testes to the excretory gland, where two diverging vessels open. Further details of the excretory system were not observed. The male and female genital pores lie close to the left margin of the body at about 0.7 mm.



*Pyelosomum parvum*. Ventral view. c., intestinal caecum; e.g., excretory gland; h., head-collar; o., ovary; s., shell-gland; v., vitelline follicles; va., vagina; v.s., vesicula seminalis.

anterior end. The cirrus-sac is flask-shaped transversely and extending to the median line. A narrow vesicula seminalis externa forms three loops at the base of the cirrus-sac. The testes are symmetrically in the posterior region of the body, lobed and transversely elongate, measuring about 0.37 mm. The ovary lies to the right of the n

### *Pronocephalid Trematodes.*

front of the right testis. It is irregular and measures 0.22 mm. in diameter. The is situated in the median line, level with and is somewhat smaller than the latter. follicles are situated laterally to the intestinal extend from the anterior borders of the testes the middle of the body. The follicles may be in a single elongate group on each side, or to three or four compact groups. The uterus numerous transverse loops, overlapping the ventral the intestinal caeca. From the female genital scalar vagina runs transversely for about half of the cirrus-sac. The eggs measure 0.035-0.015-0.017 mm., and are provided with a long each pole.

material will be deposited in the British (Museum).

much smaller than any of the three named to *Pyelosomum*. It differs from *P. 99*, and *P. posterorchis* Oguro, 1936, in having eggs with a single filament, instead of two, at each pole; and from *P. longi-* (1935), in the more lateral position of the and the greater relative length of the

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# THE ANNALS AND MAGAZINE OF NATURAL HISTORY.

[ELEVENTH SERIES.]

No. 80. AUGUST 1944.

XLVI.—*Littoral Copepoda from the Red Sea.* By A. G. NICHOLLS, Ph.D., University of Western Australia.

THE Copepods described here were collected at Ghardaqa by Dr. Robert Gurney during February and March, 1936. Dr. Gurney sent them to me later in that year, but for various reasons I have been unable to deal with them until now.

In general they comprise species previously recorded from the Mediterranean and the Indian Ocean, although one of them was first described from St. Vincent Gulf, South Australia. Among them are several interesting new forms, which are described below.

It is intended to deposit the material in the British Museum.

The following abbreviations have been used in the figures :—

a.1, first antenna.  
a.2, second antenna.  
ant., anterior.  
a.s., anal segment.  
c.r., caudal rami.  
dors., dorsal.  
end., endopod.  
exp., exopod.  
lat., lateral.

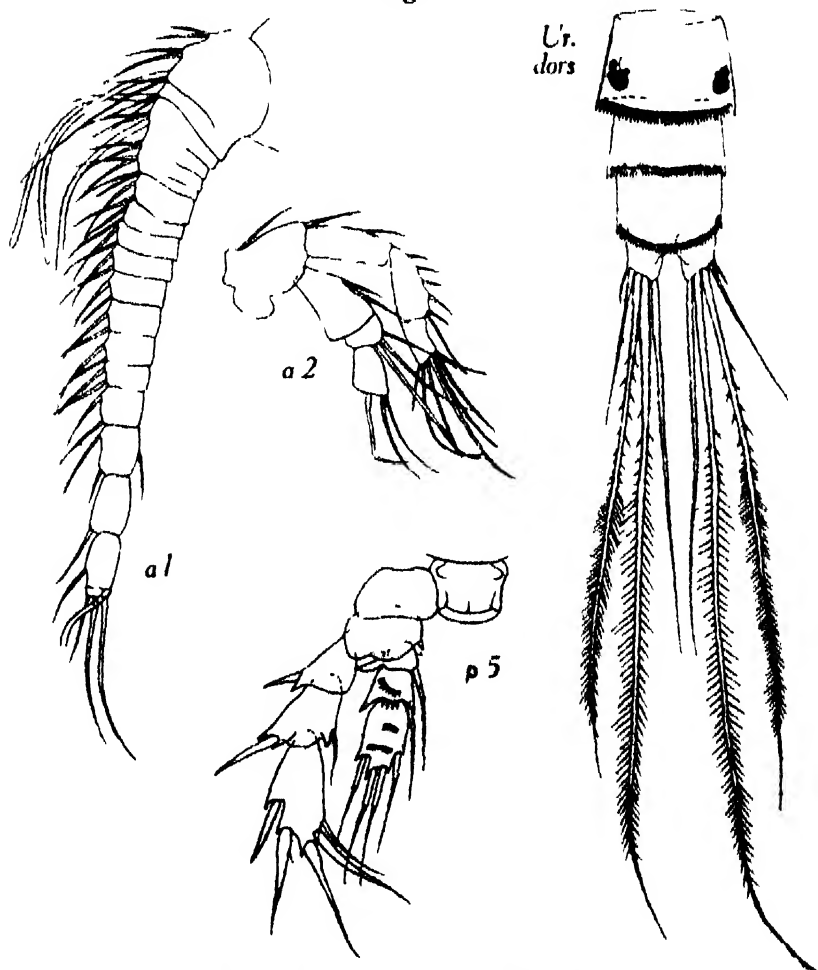
md., mandible.  
maxl., maxillule.  
mx., maxilla.  
mxp., maxilliped.  
p.1-p.6, legs 1-6.  
post., posterior.  
R., rostrum.  
Ur., urosome.  
vent., ventral.

## CALANOIDA.

*Pseudocyclops reductus*, sp. n.

*Female*.—Length 0.50–0.60 mm. (8 specimens). In many respects this species resembles *australis*, recently described from South Australia (in press), although

Fig. 1.



*Pseudocyclops reductus*, sp. n., female.  
Urosome  $\times 187$ ; appendages  $\times 312$ .

smaller in size. It differs chiefly in the reduction in the number of setae on the end segment of the fifth exopod. This feature is characteristic of the species, which has only a single seta, instead of the more usual four setae, on the inner margin of the end segment of this exopod.



It approaches *simplex* Sewell (1932), but differs in the caudal rami, first and second antennæ, and fifth legs. The following seta formula for the swimming-legs is given, but the interpretation of the distribution of the setæ and spines on the distal segments of the exopods is somewhat uncertain :—

	endopod.	exopod.
p.1.....	1.2.321	1.1.322
p.2.....	1.2.422	1.1.521
p.3.....	1.2.422	1.1.522
p.4.....	1.2.322	1.1.522
p.5.....	1.1.121	0.1.122

In the caudal rami the longer setæ are nearly three times as long as the urosome, and finely plumose. The species is illustrated in fig. 1.

#### HARPACTICOIDA.

##### Thalestridæ.

##### *Rhynchothalestris vanhoeffeni* Brady.

Brady, 1910.

Two females (1.0 mm.) occurred, which differed in some respects from Brady's description. As pointed out by Lang (1936, p. 41), *vanhoeffeni* is very like *rufocincta*, but differs in the toothed anal operculum, and in having the genital segment only incompletely divided. Brady's figures of *vanhoeffeni* show further points of difference, namely the more slender rami of the first legs, only two terminal setæ on the exopod of the second antenna, and the relatively greater width of the urosome. In the figure of the urosome (fig. 2) given here this width has been somewhat exaggerated by compression of the preparation.

If my identification is correct, and this material agrees with those features selected by Lang as well as the additional characters mentioned above, then the structure of the first antenna and rostrum as shown by Brady is not truly representative. In its remaining structures the species is identical with *rufocincta*, except that the caudal setæ are much longer than in Norman's species.

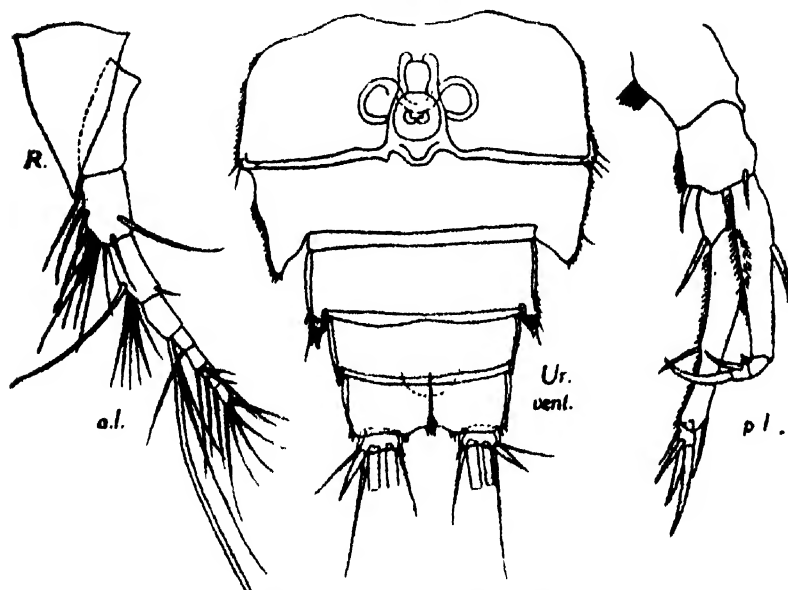
##### *Dactylopusia tisboides* (Claus).

Many specimens of this Copepod were present, the great majority being females. Over seventy specimens were separated, of which only one was a male; of the females,

nine were ovigerous. The length varied from 0.65–0.76 mm.

Lang's key to the genus (1936, p. 33) is somewhat misleading regarding this species since, as can be seen from Sars' figures, the basal segment of the fifth leg reaches to the end of the distal segment, as in *vulgaris*. Two distinctive features of this species, compared with the latter, can be observed. Firstly, in the fifth legs only the basal segments have chitinous ridges, and secondly,

Fig. 2.



*Rhynchothalestria vanhöffeni* Brady, female,  $\times 153$ .

the inner seta of the basal segment of the first endopod is slightly proximal to the middle, whereas in *vulgaris* both segments of the fifth legs have these ridges, and the seta is slightly distal to the middle of the segment.

As already noted by Gurney (1927, p. 503), the specimens from this region are smaller than those from the type locality.

#### Diosaccidae.

##### *Mesamphiascus propinquus* (Sars).

Sars, 1906, p. 158, pl. xcix.; Willey, 1930, p. 103, figs. 57, 58; Willey, 1935, p. 62; Nicholls, 1941 a, p. 79.

Two females (0.54 mm.) and one male (0.50 mm.) were found. These agree with Sars' description and figures in every respect, except for the extent of the exsertion of the

terminal setæ on the distal segment of the fifth legs in both sexes. In this respect the specimens found here agree exactly with the figures given by Willey (1930). It should be noted that the proximal outer seta of the distal segment of the female fifth leg was accidentally omitted in fig. 57, as noted by Willey (1935, p. 62). Willey's specimens were smaller than those of Sars, with which mine are in approximate agreement. The seta formula agrees with that given by Willey (1930, p. 104).

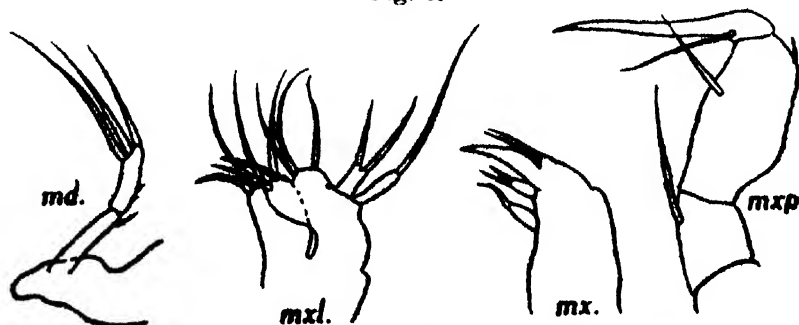
*Ialysus rufus* Brian.

Brian, 1927; Gurney, 1927, p. 505, fig. 133.

Two females, one ovigerous, were taken, which were definitely to be identified with Brian's species. (Length 0.66 mm.) The first and second antennæ, rostrum, first and fifth legs agreed with the descriptions given by Brian and Gurney. The seta formula of the swimming-legs also was in conformity with that given by Gurney.

Gurney describes the mandible palp as "apparently a long, slender unbranched rod with three setæ." In the specimen examined it appeared to be distinctly divided, with three terminal setæ as described by Gurney. This

Fig. 3.



*Ialysus rufus* Brian, female. Mouth-parts  $\times 560$ .

and the other mouth-parts are shown in the accompanying figure (fig. 3), from which it will be seen that the terminal claw of the maxilliped is provided with an accessory seta, not shown by Gurney.

*Parialysus robustus* (Nicholls).

Nicholls, 1941, 417, fig. 19 (*Tydemanelia*); 1941 a, p. 91; (in press, Journ. Roy. W. A.) fig. 3 B.

Two females were found, one of them ovigerous and bearing two egg-sacs. Length 0.70 mm. These agreed

in every respect with the emended description given in the latest of the above references.

**Pteropsyllidæ, fam. nov.**

Lang (1936 *b*, p. 135) has already expressed the opinion that a new family should be constituted for the four genera *Tetragoniceps* Brady, *Phyllopodopsyllus* T. Scott, *Pteropsyllus* T. Scott, and *Diagoniceps* Willey. With this I am in entire agreement, having arrived at the same conclusion independently.

**PHYLLOPODOPSYLLUS Scott.**

Scott, T., 1906, p. 458.

Scott's generic diagnosis requires the addition of the following character :—second endopod of male modified, bearing a process on the second segment.

The genus was established by Scott to receive a species originally described by him as *Tetragoniceps bradyi*. *T. minor* Thompson and Scott (1903) should also have been included in this genus, and seven more species have since been described, the complete list being as follows :—

*bradyi* (T. Scott), 1892, p. 253 ; Sars, 1911, p. 408.

*minor* (Thompson and Scott), 1903, p. 268 ; Willey, 1935, p. 91.

*jurciger* Sars, 1907, p. 223.

*longicaudatus* A Scott, 1909, p. 223 ; Willey, 1935, p. 88.

*moosmani* T. Scott, 1912, p. 317.

*dissimilis* Brian, 1923 (*nomen nudum* according to Monard, 1936, p. 31).

*paramoosmani* Lang, 1934, p. 35.

*armatus* Willey, 1935, p. 84.

*berrieri* Monard, 1936, p. 27.

Willey's species *armatus*, however, does not belong to this genus, nor even to the same family. Sewell (1940, p. 336) has transferred it to the genus *Laophontella*, which is much closer to its correct position.

The close relationship which exists between this genus and *Pteropsyllus* can be seen in a comparison of the fifth legs of the females. In *Pteropsyllus* the distal segment is enlarged to form the brood-pouch and the two segments are clearly defined, the basal segment being unmodified. In *Phyllopodopsyllus* both segments have participated in

the formation of the brood-pouch by expansion, and they have become closely united. Willey (1935, p. 90, fig. 149) indicates the presence of the suture at the point of fusion in *P. longicaudatus*.

With the addition of the species described below, there are now eight species in the genus.

*Key to the Species : both sexes.*

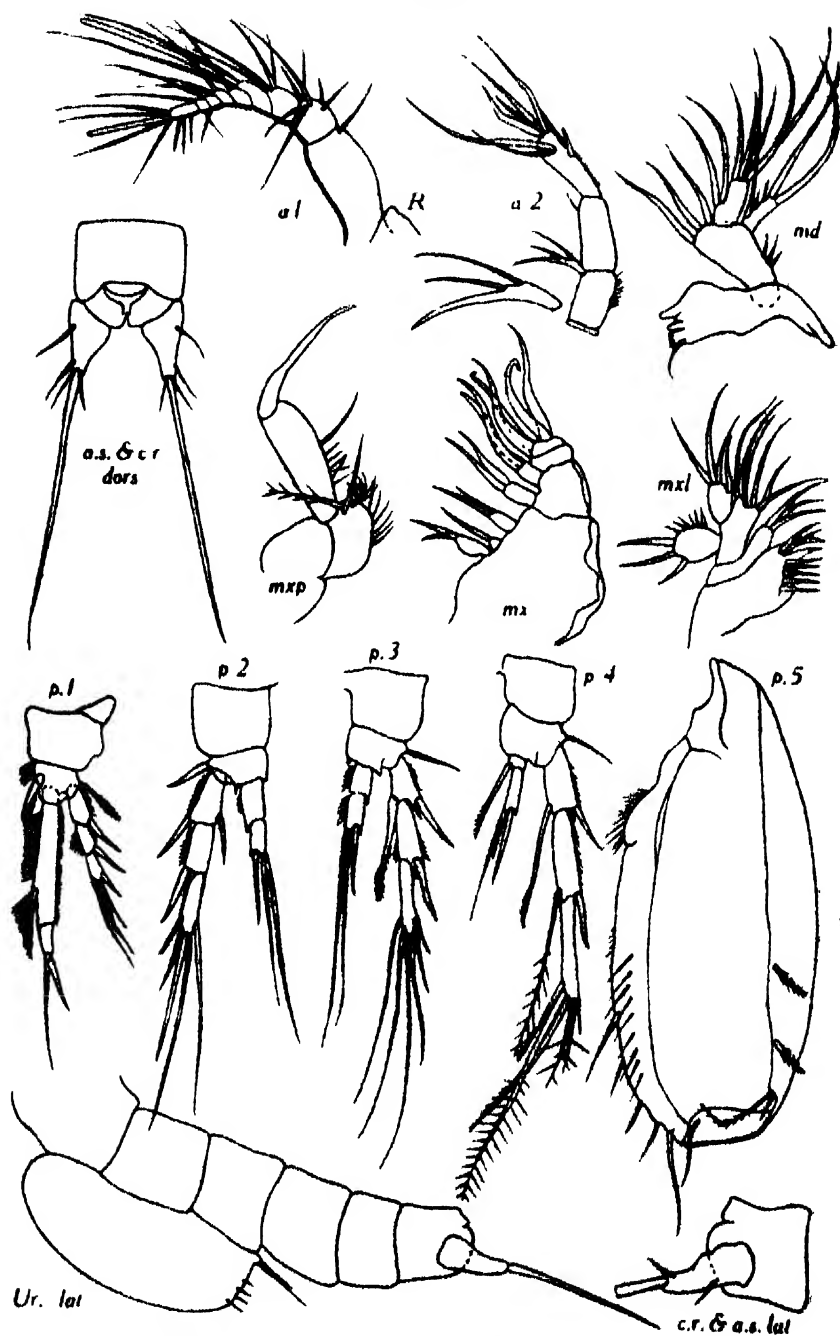
- |   |  |
|---|--|
| 1. First antenna with spur on second segment .....  | 2.                                       |
| First antenna without spur .....  | 5.                                       |
| 2. Third endopod with inner seta on basal segment .....   | 3.                                       |
| Third endopod without inner seta on basal segment .....   | 4.                                       |
| 3. Female : caudal rami with inner lamellar expansion .....   | <i>bradyi</i> (T. Scott), 1892.          |
| Caudal rami without inner expansion (male of <i>furciger</i> unknown) .....   | <i>furciger</i> Sars, 1907.              |
| 4. Female : end segment of fourth exopod with three inner setae ; male : fourth endopod with two terminal setae ..... | [1909.<br><i>longicaudatus</i> A. Scott, |
| Female : end segment with fourth exopod with two inner setae ; male : fourth endopod with one large terminal spine .. | (1903.<br><i>minor</i> (Thomp. & Scott), |
| 5. End segment of fourth exopod with two inner setae (male unknown) .....   | <i>berrieri</i> Monard, 1936.            |
| End segment of fourth exopod with three inner setae .....   | 6.                                       |
| 6. Basal segment of mandible palp with four setae .....   | <i>moesmani</i> T. Scott, 1912.          |
| Basal segment of mandible palp with three setae .....   | 7.                                       |
| 7. Basal segments of second and third endopods with setae ; middle segment of fourth exopod without seta .....        | [1934.<br><i>paramoesmani</i> Lang,      |
| Basal segments of second and third endopods without setae ; middle segment of fourth exopod with seta (male unknown)  | <i>egypticus</i> , sp. n.                |

*Phyllopodopsyllus egypticus*, sp. n.

Two females were taken, length 0.67 mm., in one of which there were three eggs contained in and filling the brood-pouch, formed from the enlarged fifth legs.

Rostrum small, triangular ; first antennae nine-segmented, with four segments in the proximal portion, the fourth and terminal segments each bearing a short sensory filament. The second antenna is three-segmented, with a one-segmented exopod borne distally on the basal segment. The mouth-parts and swimming-legs are typical in structure, differing from other species in minor details of armature (fig. 4).

Fig. 4.



*Phyllopodopsyllus aegypticus*, sp. n., female.

Urosome  $\times 144$ ; antennae, legs and caudal rami  $\times 240$ ;  
mouth-parts  $\times 400$ .

Seta formula for swimming-legs :—

	Endopod.	Exopod.
p.1.....	1.020	0.0.121
p.2.....	0.030	1.0.122
p.3.....	0.030	1.0.222
p.4.....	1.030	1.1.321

The caudal rami are about as long as the anal segment and subconical in shape, being very wide basally and tapering distally. There is a single long terminal seta, and several short setæ.

The species comes into that group in which the first antenna lacks a spur on the second antenna. This group contains *mosmani*, *paramosmani*, and *berrieri*. Of these it approaches most closely to Lang's species, but differs in several respects, notably in the exopod of the second antenna, the mandible palp, the armature of the swimming-legs, and in the short caudal rami. In the enlarged basal segment of the maxilliped it resembles *mosmani*, and in the armature of the legs it quite closely resembles the type-species, *bradyi*.

### Laophontidæ.

Nicholls, 1941 a, p. 92.

#### *Laophonte* (L.) *cornuta* Phil.

This widely-distributed species was represented in this collection by five males (0.61-0.65 mm.) and nine females (0.69-0.78 mm.).

A further specimen, an ovigerous female (0.76 mm.), had the dorsal portion of the somites of the third and fourth legs tinged with a deep purplish-black pigment. This female differed from the typical *cornuta* only in a reduction in size of the spurs on the first antennæ, on both first and second segments, and in having the fifth legs relatively slightly smaller than usual. The armature of the fifth legs was as in *cornuta*.

If these characters are constant, we have here a true variety, for which I suggest the name *nigrocincta*.

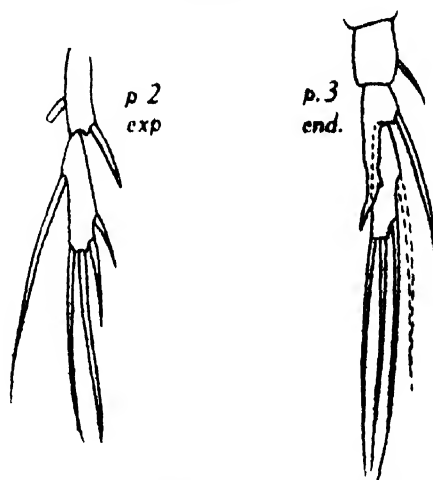
#### *Laophonte* (L.) *adduensis* Sewell.

Sewell, 1940, p. 314; Nicholls (in press, Journ. Roy. Soc. W. A., fig. 5).

A single male occurred here (0.85 mm.). This species has been described from the Maldivé Archipelago in the

Indian Ocean by Sewell, and from the coast of Western Australia in a paper sent to the press in 1942. Sewell had only females at his disposal. The male found here agrees in almost every respect with the description given for material from Western Australia. Two small differences were noted: the spines on the end segment of the second exopod are somewhat longer, and the modified spine on the middle segment of the third endopod has the proximal spur less well developed, the distal portion less strongly curved, and the terminal barb is absent. These are shown in fig. 5.

Fig. 5.



*Laophonte* (L.) *adduensis* Sewell, male,  $\times 287$ .

*Laophonte* (L.) *sporadiensis* Brian.

Brian, 1928.

Fourteen females (0.54–0.59 mm.) and six males (0.48–0.50 mm.) were found, and these agreed in all respects with the figures (105–121) given by Brian (*loc. cit.* pp. 26, 28).

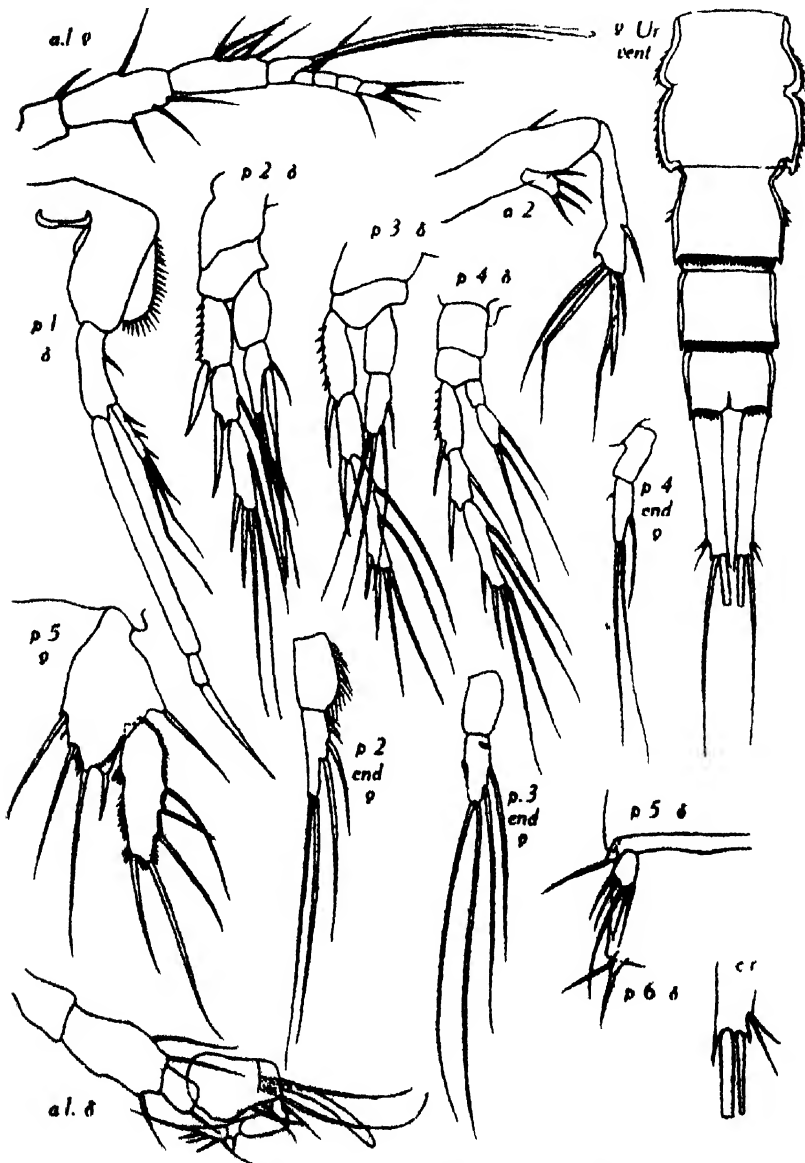
The only notable difference was in the size: Brian's specimens measured 0.725–0.755 mm. for the females, and 0.7 mm. for the males. This probably has little significance for, as is shown elsewhere in this paper, Gurney found that material from the Suez Canal tended to be smaller than that taken from the Mediterranean itself.



*Laophonte (Mesolaophonte) lamellipes*, sp. n.

The collection contained a number of specimens of both sexes. Two of the females were ovigerous.

Fig. 6.



*L. (Mesolaophonte) lamellipes*, sp. n., male and female.  
Urosome  $\times 240$ ; appendages  $\times 400$ .

**Female.**—Length 0.50–0.52 mm. (16 specimens). The body is of the shape usual to the members of this genus,

with the caudal rami six times as long as wide and twice as long as the anal segment. The first antennæ are eight-segmented, the distal portion forming about one quarter of the total length. The second antennæ are normal, with a one-segmented exopod bearing four subequal setæ. The first legs are of the typical structure, with the addition of a lamellar flange-like projection on the outer margin of the coxal segment; this is fringed with a row of fine hairs. The exopod is two-segmented, the two distal segments being fused, and with only three terminal setæ. In legs 2-4 the exopods are three-segmented and the endopods two-segmented. Both segments of the fifth legs are elongate; the proximal bears four setæ and the distal bears five (fig. 6).

*Male*.—Length 0.48 mm. (7 specimens). This differs from the female in the usual sexual characters. The first antenna is only seven-segmented, the swollen fourth segment bearing the short, stout, sensory filament. The first legs differ from those of the female only in that the segmentation of the exopod is less distinct, though a second specimen showed a condition similar to that of the female. The other legs resemble those of the female in their exopods, and differ only in minor details of shape in their endopods. The seta formula is the same for both sexes. The fifth legs are small lobes bearing five setæ; the distal portion is distinct from the basal segment. Sixth legs are present, bearing two subequal setæ.

The seta formula for the swimming-legs is as follows:—

	Endopod.	Exopod.
p.2.....	0.220	0.1.122
p.3.....	0.220	0.1.222
p.4.....	0.120	0.1.222

This seta formula suggests affinity with the *quinque-spinosa*-group of the subgenus (Nicholls, 1941 a, p. 103), but the well-developed exopod of the second antenna and the distinct segmentation of the male fifth legs do not lend support to this suggestion.

### ***Anchorabolidæ.***

Lang, 1936 c.

*Laophontodes bicornis* A. Scott.

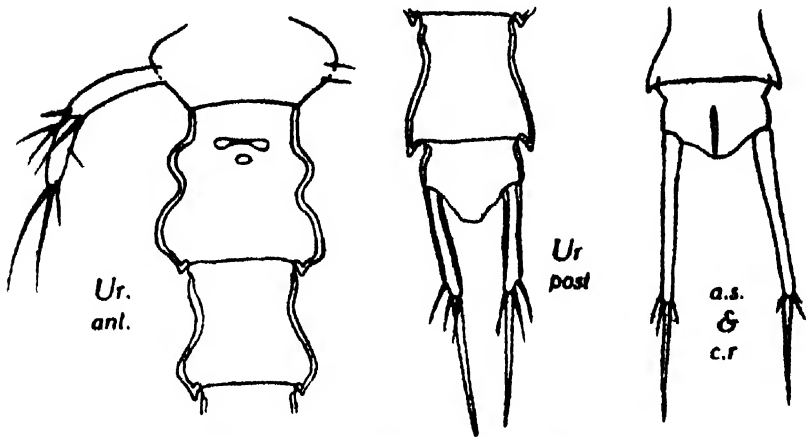
Scott, A., 1896; Sara, 1908, p. 271, pl. cxxxviii.

About forty specimens of this Copepod were separated, of which two were males and, of the remaining females,

thirteen were ovigerous. Normally seven relatively large eggs were carried. Two forms occurred, distinguished by a striking difference in the length of the caudal rami; both are shown in the accompanying figure (fig. 7). Those with the shorter form of ramus was the more common. The average length was 0.48 mm.

Lang (*loc. cit.*) gives a key to the genus.

Fig. 7.



*Laophontodes bicornis* A. Scott, female,  $\times 296$ .

*Laophontodes brevis*, sp. n.

*Female*.—Length 0.40 mm. (6 specimens). The head is rounded, more or less as in *typicus*, but the postero-lateral projections are recurved and hook-shaped. The metasome segments are rounded as in *bicornis*, but the urosome segments show little or no lateral expansion. The anal segment widens posteriorly; the caudal rami are short and stout, about twice as long as wide, and shorter than the anal segment. The first antennæ are five-segmented, with three in the basal portion; the third segment bears the usual long, sensory filament. The rostrum is short and subrectangular. The second antenna shows no trace of an exopod. The legs are more stoutly constructed than is usual in this genus, but show the typical segmentation and armature (fig. 8).

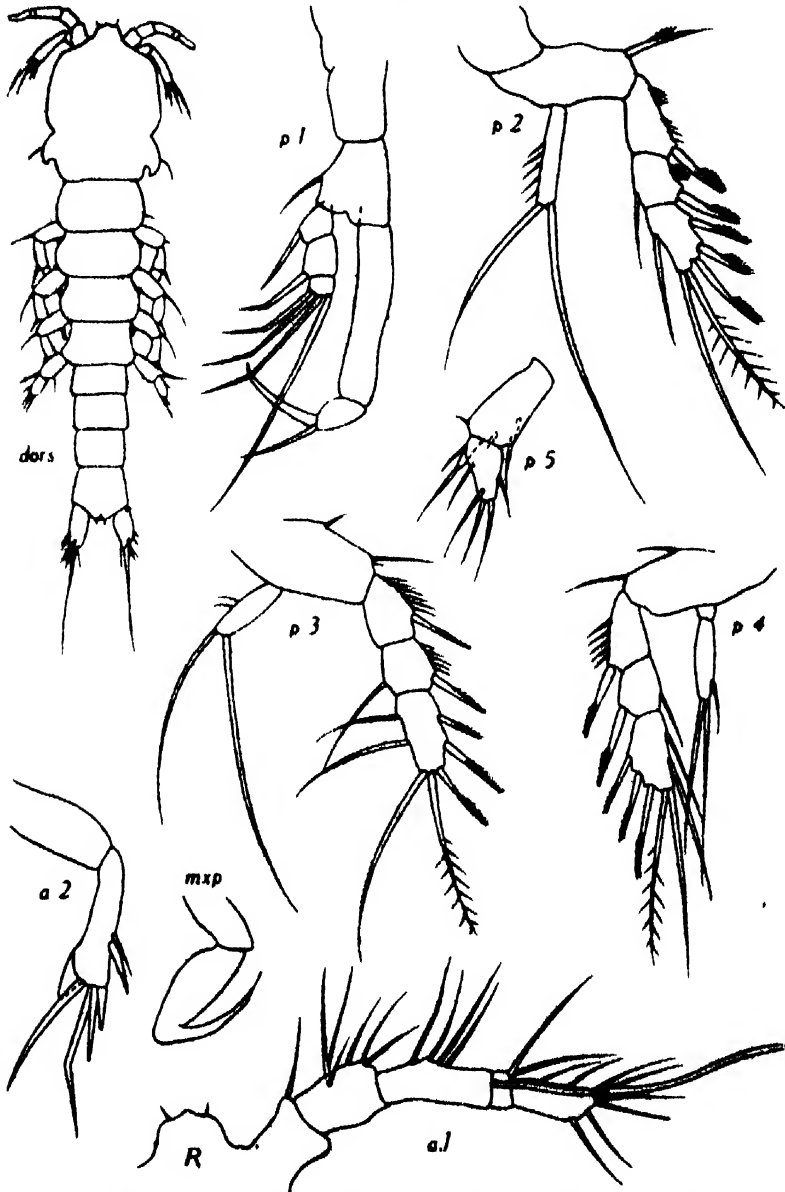
**D'Arcythompsoniidae.**

Lang, 1936 a, p. 67.

The close relationship of the genera *D'Arcythompsonia*, *Leptocaris*, and *Horsella* has been amply demonstrated

by Lang, who has placed them together to constitute this family.

Fig. 8.



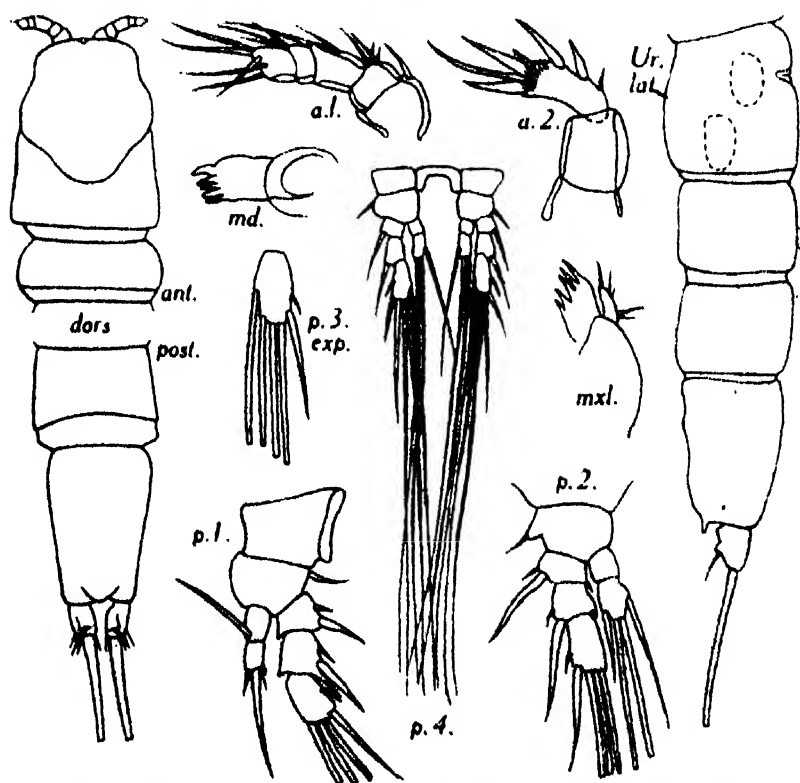
*Laophontodes brevis*, sp. n., female,  $\times 150$ ; appendages  $\times 417$ .

*Horsiella gurneyi*, sp. n.

One specimen was found, a female, containing four large eggs. Length 0.72 mm. The first antenna consists

of five short segments, no sensory filament was seen. The second antenna lacks an exopod, and the mandible is without a palp; the maxillule has its palp only one-segmented; the maxilla was not seen. The legs show the normal segmentation, but differ from the two known species in details of armature. The terminal setae on both rami of the legs are relatively much longer than in either *brevicornis* or *trisetosa*. These are illustrated in the figure (fig. 9) of the fourth legs, which have been drawn

Fig. 9.



*Horeiella gurneyi*, sp. n., female. Dorsal view and urosome  $\times 164$   
fourth legs  $\times 273$ ; other appendages  $\times 455$ .

at a lower magnification in order to include these setae. No fifth legs could be found, and these, which are normally very reduced in this genus, are presumed to be absent in this species. The caudal rami are relatively shorter than in *brevicornis* and are of a distinctive shape.

The size of this species is somewhat greater than that of either *brevicornis* (van Douwe) (cf. Gurney, 1932,

p. 308) or *trisetosa* Kunz (1935), but in view of the range given for the former by Gurney (*loc. cit.*) this is probably of little significance.

The least reduction is shown in *trisetosa*, in which the mandible retains a minute palp, and the species described here shows the greatest amount of reduction in the lack of palp in the mandible, absence of exopod on the second antenna and absence of fifth legs.

The two previously-described species appear to inhabit fresh to brackish water: this species, taken at low water neaps, would appear to be truly marine.

### Metidae.

#### *Metis jousseaumei* (Richard).

This species was found abundantly in all stages, from 8 fathoms.

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XLVII.—*A Key to the Genera of Brachyderinæ of the World.* By F. I. VAN EMDEN (Imperial Institute of Entomology, London).

THE following key is a modified translation of the synopsis published in 1932 and 1936 (*Stett. ent. Zeit.* xciii. pp. 116-119 and xcvii. pp. 66-99, 211-239) as a supplement to the Brachyderinæ part in Junk-Schenkling's 'Coleopterorum Catalogus,' parts 119, 147, 153 and 164. This translation has been prepared for publication at the request of Dr. Elwood C. Zimmerman of Honolulu, supported by Sir Guy A. K. Marshall and Mr. J. Balfour-Browne. The genera described in the intervening period have been incorporated and various corrections due to other publications or routine work, mainly by Sir Guy A. K. Marshall, have been made. Much of the introductory notes and of the classification adopted are termed *outer* or *inner* keys; other parts (definition of the group) are termed *enclosed* or *at least* condensed, but the explanation of the terms as used is given at the end of the paper.

the corbels has been given in full and the figures republished. A short note on the difference between free and connate claws, with figures, has been added.

Thanks for the improvements made in the keys and resulting from their perusal are almost exclusively due to Sir Guy Marshall, who has also been kind enough to read the manuscript. Assistance in various way has also been received from Mr. J. Balfour-Browne.

*Definition of the Brachyderinæ* : Adelognatha without ocular lobes, and with a lateral antennal scrobe, which is sharply defined even dorsally, and the ventral and dorsal boundaries of which are strongly bent downwards, so that the scape, in resting position, does not cover the lower extremity of the eye. Mandibles multisetose (see Marshall, 1942, Ann. & Mag. Nat. Hist. (11) ix. p. 2).

By this definition of the downwardly curved antennal scrobes *Compsus*, *Platyomicus*, *Plococompsus*, *Exorides*, *Xestogaster*, *Diaprepes*, *Prepodes*-*Exophthalmus*-*Exophthalmodes* are removed from the Brachyderinæ, and the latter can be separated fairly well from the Otiorrhynchinæ, etc.

*Scythropus* belongs to the Adelognatha owing to the presence of a well-developed mandibular scar in the adult and the formation of the antenna, etc., in the larva, in spite of the free maxillæ of the beetle. The Sitonini have a somewhat isolated position, but their characters are mainly those of the Adelognatha both in the adult and the larva, and in the genus *Eugnathus* a specimen with a mandibular appendage has actually been found (see figure in Stett. ent. Zeit. xcvi. p. 69). This appendage is situated near the apex above the cutting edge and is directed backwards. The corresponding part of the mandible in *Sitona* is not developed as an appendage but is pointed, directed inward, and partly defined by a furrow. It becomes entirely black shortly before the adult hatches as at that time very strikingly distinct from the rest of the main part of the mandible (see figure in Stett. ent. Zeit. xcvi. p. 236). Like the Adelognatha, *Scythropus* and *Zootoma* deposit their eggs on the needles or leaves of the host plant, and the young larvæ drop to the ground and burrow into the soil in search of roots, on which they feed. *Ibid.* f. 1936. Genera of Otiorrhynchinæ as can easily be distinguished with Brachyderinæ, and some genera of Brachyderinæ, which can easily be traced to several places in (I.) are referred to in footnotes. Genera not seen



by myself nor incorporated by Sir Guy Marshall in the original Key are marked by an asterisk (\*).

**Corbels.** This term, as well as *tarsal grooves*, only applies to the third pair of legs. The tarsal grooves are the (usually somewhat excavate) area at the apex of the hind tibiae, in which the tarsi articulate, and the extension of this area on the postero-dorsal (inner hind) surface of the tibiae, into which the tarsi can be retracted (figs. 1-3, *t*). The designation corbel refers to the apex of the hind tibiae anterior (outward) to the tarsal groove. The corbels are *open* if the apex of the tibiae forms a simple edge, more or less fringed with setae (fig. 1, *c*). If the corbels are open, the apices of the other two pairs of legs are formed in the same way. Sometimes the anterior

Figs. 1-3.

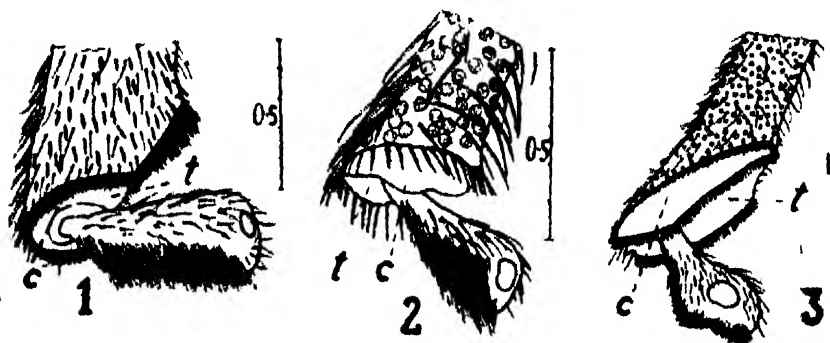


Fig. 1.—*Brachyderes incanus* L. Apex of left hind tibia, viewed obliquely from apex and exterior side: *c*, corbel; *t*, tarsal groove. Corbel open. Leitz microscope, eyepiece 3, objective 2; scale 0.5 mm.

Fig. 2.—*Amystax fasciatus* Roel. The same. Corbel semi-enclosed. Leitz 4, 2; scale 0.5 mm.

Fig. 3.—*Catapionus viridanus* Tourn. The same. Corbel enclosed. Leitz 1, 2; scale 1.0 mm.

apical edge of the hind tibiae is double, but only the outer one of the two edges is fringed, whilst the inner edge and the interspace are bare. These corbels are *semi-enclosed* (pseudocavernose, fig. 2, *c*). In this case, too, the other legs are similar. If the anterior edge is double, and both the outer and inner part fringed (fig. 3, *c*), they are termed *enclosed*. The outer edge may be very sharp or at least provided with a very conspicuous row of spines or setae, or it may be obtuse and inconspicuously haired, and the

interspace may be bare or squamose ; in every case the decisive point is that the apex of the tibiae is obliquely truncate to the outer side of the fringed edge next to the insertion of the tarsi. *Enclosed corbels* occur only on the hind tibiae.

*Claws.* There are two types of claws, which, within the Brachyderinae, are not connected by any transitions, and which are termed free and connate. It may very well be that sometimes the extreme bases of free claws are fused and the claws thus not movable against each other, but the term connate is not applied to these cases. *Free* claws are those the inner surfaces of which are not contiguous (figs. 4 and 5) and describe as a rule a more

Figs. 4-6.

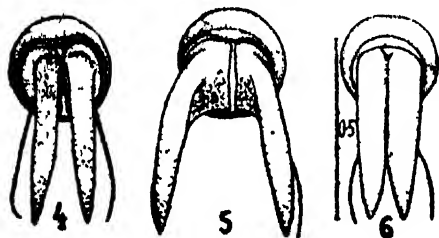


Fig. 4.—*Naupactus argentinensis* Hust. Left hind claws.

Fig. 5.—*Naupactus argentinensis* Hust. Right hind claws of the same specimen.

Fig. 6.—*Polyclæis equestris* Boh. Right middle claws. Leitz microscope, eyepiece 4, objective 3 ; scale 0.5 mm.

or less concave curve, whilst in *connate* claws the inner surfaces are perfectly contiguous in the basal half or even more, and appear convex if the claws are viewed dorsally (fig. 6).

The difference in the formation of the frons between Naupactini and Barynotini may sometimes give reason for doubt. It was first used by Champion, and in my opinion circumscribes two well-founded groups, which are very natural, especially as far as the Naupactini are concerned. In case of doubt it will be necessary to try the keys to both tribes.

### *Key to the Tribes and Subtribes.*

- 1 (28). Apical exterior surface of the mandibles with a scar, or lasting appendage, exceptional ; without either (*Meothor. rhynchus*), but then the prothorax with vibrissae. Auxiliary claws absent.

Antennal scrobe never sharply T-shaped. If the antennal scrobe runs downward almost at right angles with the longitudinal axis of the rostrum, the pronotum with vibrissæ or the fore coxæ contiguous and at the same time two claws present.

- 2 (23). Pronotum without cilia (vibrissæ) at the sides of the front margin.
- 3 (10). Claws free.
- 4 (9). Rostrum seldom defined from head by a furrow, but then this is more or less shallow and forms only a transverse impression or fine groove. In these cases the dorsum densely covered with scales.
- 5 (6). Mentum covering the maxillæ incompletely. The dorso-apical part of the rostrum smooth to beyond the antennal insertion and separated by a transverse groove or impression, or the rostrum is twice as long as wide, or it is separated from the frons by a fine but deep groove. Corbels open or semi-enclosed . . . . .
- 6 (5). Mentum covering the maxillæ more or less completely, rarely somewhat incompletely, but in this case the dorso-apical part of the rostrum to beyond the antennal insertion not smooth and separated and the rostrum not twice as long as wide, separated from the frons by at most a slight transverse impression.
- 7 (8). Eyes entirely lateral, the frons therefore, as a rule, considerably wider than the rostrum, rarely of the same width or even slightly narrower; in these cases (and in fact as a rule) frons and rostrum quite plain and with a sharply engraved median groove<sup>1</sup>; never with a sharp transverse groove separating rostrum and head. Corbels open or enclosed, in the latter case almost always hairy or squamose, but if they are bare, the rostrum with a deep longitudinal groove. Eyes freely visible from above . . . . .
- 8 (7). Eyes partly encroaching upon dorsal surface, frons therefore narrower than rostrum, seldom as wide as the latter, but in this case rostrum and frons somewhat sloping towards sides and at most with a broad and shallow longi-

1. *Anypotactini*.

2. *Naupactini*.

<sup>1</sup> If the latero-dorsal edges of the rostrum are strongly raised at apex, and the antennal scape is incrassate whilst the other characters are those of *Stenocyphus*, etc., see *Platyomus*, *Curiaules* and *Pseudocyphus* of the Otiorrhynchine.

- tudinal depression, not with a sharply engraved median furrow. The second visible ventrite longer than the third, almost always separated by a curved suture from the first; this suture is seldom straight, but then the second ventrite much longer than the third<sup>1</sup>.
- 9 (4). Rostrum defined from head by a very deep, sharp and rather broad transverse groove, the latter as a rule about as wide as the base of the scape; the latter exceeds the hind margin of the eyes considerably. Prothorax large, subglobose. Apex of fore tibiae strongly dilated interiorly and exteriorly . . . . .
- 10 (3). Claws connate or only of 1<sup>st</sup> claw present.
- 11 (20). Corbels open or slightly obliquely truncate or semienclosed, but very seldom enclosed and with two rows of setules (a few *Cratopus*); in this case the shoulders well developed, the frons not separated from rostrum, the fore legs enlarged, and the antennal scrobes not extending to the ventral surface of the rostrum.
- 12 (17). Head not constricted behind the eyes
- 13 (14). Fore legs much longer than the others, fore femora much stouter. Mesoepipimera not very wide, but their inner margin directed obliquely forward, separating the mesoepipisterna completely from the side margin of the elytra. Shoulders present or absent. Corbels sometimes enclosed. Femora almost always toothed . . . . .
- 14 (13). Fore legs not longer than the others, the fore femora seldom distinctly stouter than the mid- and hind femora. The inner margin of the mesoepipimera directed more outwardly, so that the mesoepipisterna reach the side margin of the elytra more or less broadly. Corbels open or semi-enclosed, never enclosed.
- 15 (16). Shoulder-region of the elytra distinctly, usually much, wider than the hind margin of the prothorax, shoulders more or less distinct . . . . .
- 16 (15). Shoulder-region of the elytra hardly wider than the hind margin of the prothorax, shoulders absent. . . . .
- 17 (12). Head more or less constricted behind the eyes, sometimes only on the dorsal or ventro-lateral surface (the apex of the rostrum should be turned towards the light). Femora unarmed.
3. *Barynotini*.
4. *Psalidini*.
5. *Cratopini*.
6. *Polydrosini*.
7. *Brachyderini*.

<sup>1</sup> The second visible ventrite hardly longer than the third, separated from the first by a straight suture; shoulders rounded; wings absent; corbels open. *Hormorus* and *Agasphaerops* of the Otiorhynchinae.

- 18 (19). Second visible ventrite considerably longer than the third or fourth, separated from the first by a curved suture ..... 8. *Strophosomini*.
- 19 (18). Second visible ventrite not or hardly longer than the third or fourth, separated from the first by a straight suture. Rostrum always separated from head by a suture. Shoulders absent ..... 9. *Blasygrini*.
- 20 (11). Corbels enclosed, with two rows of setules. If the shoulders are well developed and at the same time the rostrum not separated from head by a furrow or impression, the fore femora not larger than the hind ones.
- 21 (22). Shoulders well developed ..... 10. *Dermatodini*.
- 22 (21). Shoulders absent ..... 11. *Cneorrhinini*.
- 23 (2). Pronotum at least with a few, usually with many, cilia (vibrissae) at the sides of the front margin ..... 12. *Tanymecini*.. 24
- 24 (27). Claws free.
- 25 (26). Rostrum not separated from frons by a furrow or distinct impression..... 12 a. *Tanymecina* <sup>3</sup>.
- 26 (25). Rostrum separated from frons by a furrow or a distinct impression, which reaches the lateral part of the dorsum. 12 b. *Prypnina* <sup>4</sup>.
- 27 (24). Claws connate, or only one claw present. 12 c. *Piazomiina*.
- 28 (1). Apical exterior surface of the mandibles without a scar or lasting appendage, at the most with an appendage or scar next to the cutting edge, the appendage in this case directed towards median line. Pronotum not ciliate at the sides of the fore margin. Some Ottistirini have a scar near the base of the ventral surface of the mandibles; in this case the antennal scrobe sharply T-shaped or the antennal scrobe proper almost at right angles with the longitudinal axis of the rostrum and at the same time only one claw present and the fore coxae broadly separated.
- 29 (30). Exterior surface of mandibles with scales and hairs. At the base of each claw arises an auxiliary claw of sub-equal length. Front coxae contiguous. 13. *Sitonini*.
- 30 (29). Exterior surface of mandibles at most with single hairs. Auxiliary claws absent.
- 31 (32). The dorso-apical part of the rostrum separated by a transverse groove,

<sup>3</sup> The genera *Ploccocompsus*, *Diaprepes* and *Elytrocallus* would be traced to this group if they were placed in the Brachyderinae. However, the scape covers in resting position the lower part of the eyes.

<sup>4</sup> That *Prypnus* and *Prostomus* are provided with vibrissae and must, contrary to Lacordaire's opinion, be included in the Tanymecini has already been recognised by Faust (1886, Dt. ent. Zeitschr. xxx. p. 362).

which prolongs the antennal scrobe forward and inward, glabrous. If the transverse groove is absent, the antennal scrobe proper running downward almost at right angles with the longitudinal axis of the rostrum.

Front coxae contiguous or separated.

14. *Ottistirini*.

- 32 (31). The dorso-apical part of the rostrum very seldom (*Apocryptidius*) separated by a transverse groove (though sometimes by a transverse impression); in this case the transverse groove not continuous with the antennal scrobe, the latter running obliquely downward and backward . . . . .

15. *Pachyrrhynchini*.

### 1. *Anypolactini*

- 1 (8). Shoulders and wings present. Fore coxae contiguous. Mandibular scar not very large, not projecting <sup>5</sup>.
- 2 (3). Rostrum not separated from frons. Femora unarmed. Nasal plate extremely small and indistinct; dorso-apical part of rostrum not set off, the latter strikingly long . . . . .
- 3 (2). Rostrum separated from frons by a transverse groove.
- 4 (7). Femora toothed.
- 5 (6). Dorso-apical part of rostrum set off, rostrum rather short; nasal plate large and conspicuous . . . . .
- 6 (5). Dorso-apical part of rostrum not set off.
- 7 (4). Femora unarmed . . . . .
- 8 (1). Shoulders and wings absent. Fore coxae separated or contiguous.
- 9 (14). Corbels open.
- 10 (11). Front coxae contiguous. Femora with a pointed tooth. Nasal plate distinct; dorso-apical part of rostrum rather smooth and set off. Antennal scape reaching hind margin of eyes . . . . .
- 11 (10). Front coxae separated. Femora unarmed.
- 12 (13). Front coxae broadly separated. Front tibiae with strong and pointed denticles. Antennal scape not quite reaching hind margin of eyes . . . . .
- 13 (12). Front coxae very narrowly separated. Front tibiae not distinctly denticulate. Antennal scape reaching fore margin of prothorax . . . . .
- 14 (9). Corbels semi-enclosed. Front coxae contiguous. Femora with a very fine

*Prepodellus*.

*Anypolactus*.

*Phanasora*.

\* *Neonypolactus* <sup>6</sup>.

*Parasonus*.

*Cylloproctus*.

*Bothynodontes*.

<sup>5</sup> Base of the scar somewhat produced, the scar therefore projecting. Fore coxae narrowly separated: see *Polydactrys* and *Pandeleterius* (*Tanymecini*), in which the vibrissae are sometimes absent.

<sup>6</sup> Hustache, 1938, Arb. morph. tax. Ent. v. p. 266.

denticle. Dorso-apical part of rostrum rather smooth, but set off only by a slight impression. Rostrum separated from frons only by a broad impression. Inner edge of fore tibiae only slightly and very bluntly denticulate . . . . .

*Hypometopus.*

2. *Naupactini.*

1 (4). Eyes lying on a short prominence, or at least the temples constricted behind them; in this case the corbels open.

2 (3). Corbels enclosed and hairy. Base of the elytra keeled. The eyes lying on a short prominence, the head appearing somewhat constricted behind them.

*Ischnomias.*

3 (2). Corbels open. Base of the elytra not keeled. Eyes not lying on a prominence, only the temples constricted. Mandibles squamose. Rostrum wider than long, strongly narrowed to apex. Tibiae produced interiorly into a strong apical spine. Antennae very short, the scape not reaching fore margin of eyes, the club hardly reaching middle of prothorax . . . . .

*Corecaulus.*

4 (1). Eyes not lying on a prominence but often strongly protruding; if the temples are constricted behind them, the corbels enclosed. (America and Palearctic Region; *Pantomorus* in part more widely distributed.)

5 (88). Corbels enclosed.

6 (69). Shoulders well developed, rarely rather broadly rounded (*Trichocypsus*, *Amphideritus*), but then the elytra in their entire length with long erect hairs.

7 (32). Front coxae inserted little closer to the fore than to the hind margin of the prothorax, seldom almost twice as close to the former, but in this case the pronotum with a very broad discal impression that extends over its whole length, or the whole beetle beset with long erect hair. Shoulders always obtuse-angular and much wider than the prothoracic base, the latter always bisinuate.

8 (21). Mentum acetose.

9 (12). Antennal scape not overpassing the eyes. Second tarsal joint strongly transverse. Mesoepimera rather large, triangular.

10 (11). Corbels ascending by less than the apical width of the tibiae; tarsal groove bare. Dorsal surface of the rostrum parallel-sided, quite plain, with a fine median furrow. Temples not constricted behind the eyes . . . . .

*Hadropus.*

11 (10). Corbels ascending by much more than the apical width of the tibiae; tarsal

- groove squamose. Dorsal surface of the rostrum not quite plain, with a broader and deeper median furrow. Temples somewhat constricted behind the eyes ..... *Tricydeus*
- 12 (9). Antennal scape overpassing the eyes<sup>7</sup>. Second tarsal joint not or hardly transverse.
- 13 (14). Corbels strongly ascending. Second to fifth funicular joints of the antennæ longer than wide; scape only slightly exceeding the eyes. Temples with an impression behind the eyes. Elytra laterally compressed, shoulders with a toothlike tubercle; seventh interval rib-like. Dorsal surface with scales and erect hairs. (For *Trichocyphus curvipennis* Hust.) ..... \**Mendozella*<sup>8</sup>.
- 14 (13). Corbels ascending at most by the apical width of the tibiæ.
- 15 (20). All funicular joints much longer than wide. Hind tibiæ with an interior apical spine. Mesoepimera narrow, almost trapezoidal.
- 16 (17). Dorsal surface with only appressed scales, the apex of the elytra with some erect setules. Pronotum with a large discal impression. Corbels broadly enclosed ..... *Stenocyphus*.
- 17 (16). Dorsal surface with erect bristles and appressed scales.
- 18 (19). Front tibiæ somewhat incurved at apex, their inner edge denticulate. Pronotum without a large discal impression. Corbels not so broadly enclosed. .... *Brachystylodes*.
- 19 (18). Front tibiæ straight, their inner edge "spinulose but not denticulate" .... \**Neorricydeus*<sup>9</sup>.
- 20 (15). The third to seventh funicular joints not, or only partly and slightly, longer than wide. Corbels narrowly enclosed<sup>10</sup>. Even the hind tibiæ with an internal spur at apex. Mesoepimera large, triangular ..... *Cyphopsis*.
- 21 (8). Mentum with a few fine setæ.
- 22 (25). Corbels ascending at least by the apical width of the tibiæ. The dorso-apical part of the rostrum gradually, slightly and evenly sloping towards the mandibles. Elytra with more or less distinct auxiliary rows of punctures.

<sup>7</sup> Antennal scape incrassate. Dorsal surface of rostrum strongly elevated at sides: *Platymus*, *Curiades*, *Pseudocyphus*, which are placed in the Otiorrhynchinae.

<sup>8</sup> Hustache, 1939, An. Soc. cient. Argent. cxviii, p. 42.

<sup>9</sup> Hustache, 1938, Bull. Soc. ent. France, xliii, p. 93.

<sup>10</sup> \**Priocyphus* (Hustache, 1939, An. Soc. cient. Argent. cxviii, pp. 39, 43) is apparently very closely related. The corbels are possibly broadly enclosed.



- 23 (24). Antennal scape passing eye, more strongly dilated only towards apex. The auxiliary rows of punctures on the elytra irregular. Body densely and evenly squamose . . . . . *Cyphus*.
- 24 (23). Antennal scape not passing eye, strongly dilated and compressed from near base onwards. Elytra with about 20 rather regular rows of punctures, which are somewhat less marked only outwardly. . . . . *Acyphus*.
- 25 (22). Corbels ascending by less than the apical width of the tibiæ. A triangular dorso-apical area of the rostrum suddenly deepened and defined from the rest of the dorsal surface by something like a callosity. Elytra with the normal ten rows of punctures. Mesopimera large and triangular.
- 26 (29). Antennal scape not exceeding the eye. Hind tibiæ without a spur at inner apex. Rostrum with a dorso-lateral keel; below the keel with an impression in front of the eyes.
- 27 (28). Pronotum not or hardly convex longitudinally. Antennal scrobes curved downwards moderately strongly and evenly. Dorsal surface with short and not very conspicuous hair . . . . . *Lamprocyphus*.
- 28 (27). Pronotum strongly convex longitudinally, humped. Antennal scrobes curved downward strongly and almost at an obtuse angle. Dorsal surface with long, rough and dense hair . . . . . *Trichaptus*.
- 29 (26). Antennal scape exceeding eye. Rostrum without a dorso-lateral keel, at most with a slight callosity.
- 30 (31). Corbels broadly enclosed, squamose. Hind tibiæ with an inner apical spur. Rostrum with a distinct subdorsal impression in front of eye . . . . . *Thoracocyphus*.
- 31 (30). Corbels narrowly enclosed, bare. Hind tibiæ without an inner apical spur. The subdorsal impression of the rostrum almost completely hidden by the scales . . . . . *Artipus*.
- 32 (7). Fore coxæ inserted much closer, usually at least twice as close, to the fore than to the hind margin, rarely only somewhat nearer to the former, but then the shoulders not or hardly wider than the base of the prothorax. Pronotum sometimes with an engraved median line or with the disc indistinctly flattened out, but without a broad impression that takes up its entire length. If the dorsal surface is covered by erect hair the shoulders rather broadly rounded.
- 33 (40). Inner edge of front tibiæ without a trace of denticulation (at a microscope-

- magnification of 57 times), the outer edge straight to the apical curvature. Antennal scape of male strongly incrassate. Femora unarmed. Legs with rather long hairs or bristles.
- 34 (37). Prothorax subcylindrical, the basal half almost parallel-sided, shoulders of the elytra much wider than its base.
- 35 (36). The outer striae of the elytra coalescing in the basal third, elytra broad, with some tubercles. Fore tibiae dilatate and strongly bisinuate on inner side. Nasal plate large, triangular, depressed, rugose . . . . . *Tetragonomus*.
- 36 (35). Even the outer striae of the elytra complete, elytra slender, without tubercles. Fore tibiae slender, strongly dilated interiorly at apex, the inner margin only slightly bisinuate<sup>11</sup> . . . . . *Chamaelops*.
- 37 (34). Prothorax conical, strongly dilated to base, shoulders of the elytra moderately, hardly or not at all wider than its base. Striae of the elytra complete.
- 38 (39). Front tibiae rounded exteriorly at apex. Body covered with dense and rather long erect bristles<sup>12</sup>. Shoulders somewhat broader than the base of the prothorax . . . . . *Megalostylodes*.
- 39 (38). Front tibiae produced into a tooth exteriorly at apex . . . . . *Megalostylus*.
- 40 (33). Inner edge of front tibiae with a distinct denticulation (at a microscope-magnification of 57 times); if it is very fine and sparse all the femora with 1-2 fine pointed denticles. Antennal scape of male not incrassate.
- 41 (64). Base of pronotum bisinuate or simply concave or at least the hind angles distinctly acute; usually both characters present, seldom the base convex or straight and the hind angles obtusely rounded or right, but then the mid and hind tibiae not denticulate and the elytra everywhere with erect setae.
- 42 (59). Prothorax slightly or moderately transverse to subcylindrical, the basal margin only slightly higher than the

<sup>11</sup> \**Wagneriella* Hust. (An. Soc. cient. Argent. xevi, p. 294) would probably be traced to this paragraph but is considered to belong to the Leptopinae, Promecopini, though ocular lobes are absent. The genus seems to be very similar to *Chamaelops*, but the antennal scrobe does not approach the eye so closely and is apparently more strongly curved downward. Second funicular joint thrice as long as the slender third joint.

<sup>12</sup> \**Floresianellus* Hust. (1939, An. Soc. cient. Argent. cxxviii, pp. 39, 41) is apparently similar, but the dorsal bristles are short and not very numerous. The antennal scape is slender, but the sex of the type is unknown.

metathoracic peduncle, the declivity therefore narrow in posterior view; basal margination indistinct or fine; base not very strongly bisinuate or simply emarginate, less often straight or convex.

- 43 (44). Head at sides with a slight but distinct neck-constriction. Fore tibiae with a dense row of strong, equal denticles. Head between the median furrow and the eyes with a groove that curves outward and downward behind, around the temples<sup>13</sup> ..... *Plectrophorus*.
- 44 (43). Head without a neck-constriction.
- 45 (56). Femora unarmed ..... *Macrostylus*.....46
- 46 (53). Elytra with long erect setae. Second funicular joint as a rule hardly longer than the first.
- 47 (50). Corbels not squamose.
- 48 (49). Elytra at least one and a half times as long as their combined width..... Sbg. *Pterotropis*.
- 49 (48). Elytra hardly one-fourth longer than their combined width ..... [s. str. Sbg. *Macrostylus*,
- 50 (47). Corbels squamose.
- 51 (52). Shoulders broadly rounded, not much wider than the prothorax ..... Sbg. *Amphideritus*.
- 52 (51). Shoulders well developed, much wider than the prothorax ..... Sbg. *Mimographus*.
- 53 (46). Elytra without long erect setae. Second funicular joint conspicuously longer than the first. Shoulders well developed.
- 54 (55). Dorso-apical part of rostrum not defined. Shoulders simple<sup>14</sup>. Ninth and tenth striae of the elytra not very clearly separated in the second third..... [phopsis, Sbg. *Mimogra-*
- 55 (54). Dorso-apical part of rostrum up to the insertion of the antennae defined by a transverse impression between these insertions. Ninth and tenth striae of the elytra clearly separated in their entire length ..... Sbg. *Steirarrhinus*.
- 56 (45). At least the front femora with one to several small spiniform denticles. Dorso-apical part of rostrum up to the insertions of the antennae usually set off by a transverse impression or different scales. Dorsal surface without long erect bristles.

<sup>13</sup> From the description and figure (Hustache, 1939, An. Soc. cient. Argent. cxxviii, p. 39, fig. 3) it appears that *\*Floresianus* Hust. will be traced to this paragraph. The groove between the median furrow of the head and the eyes is, however, evidently not present.

<sup>14</sup> Shoulders with a strong toothlike tubercle: *Cyphodellus* Hust. (1939, An. Soc. cient. Argent. cxxviii, p. 39, for *Naupactosis lizeri* Hust.). This genus should perhaps come under paragraphs 7 and 8, but the characters mentioned by Hustache do not suffice for deciding this question or for fitting the genus into that section of the key.

- 57 (56). Antennal scape not exceeding hind margin of eye. Metasternum much longer than mid-coxae. Intercoxal process of abdomen much narrower than a hind coxa. Elytra elongate and parallel-sided. . . . . *Hoplopactus*.
- 58 (57). Antennal scape exceeding hind margin of eye. Metasternum not longer than mid-coxae. Intercoxal process of abdomen about as wide as a hind coxa. . . . . *Moropactus*<sup>15</sup>.
- 59 (42). Prothorax strongly transverse, the basal margin lying high above the meta-thoracic peduncle, the declivity therefore broad in posterior view; basal margination distinct and often forming a broad callosity, seldom absent, but then the base very deeply bisinuate.
- 60 (63). Only the front tibiae finely denticulate on inner edge. Tarsal grooves bare. Eyes strongly convex.
- 61 (62). Base of pronotum not margined, deeply bisinuate. Antennal club pointed-oblong-ovate, about two and a half times as long as broad. Head strongly constricted behind eyes . . . . . *Litostylus*
- 62 (61). Base of pronotum margined and less deeply bisinuate. Antennal club slender, fusiform, usually about thrice as long as wide or longer. . . . . *Naupactus*.
- 63 (60). Mid- and hind tibiae also denticulate on inner edge, the fore tibiae very coarsely denticulate. Tarsal grooves squamose. Eyes moderately convex. Antennal club acuminate-ovate, not quite two and a half times as long as wide . . . . *Enoplopactus*.
- 64 (41). Base of pronotum convex, the convex curve sometimes slightly emarginate on either side, the hind angles obtusely rounded or rectangular. If the mid- and hind tibiae are not denticulate on inner edge, at most the apical part of the elytra with some long erect hairs.
- 65 (68). The mid- and hind tibiae denticulate on inner edge, fore tibiae very coarsely so.
- 66 (67). Tarsal grooves squamose. Eyes moderately convex. Among the coating of appressed scales with semi-appressed broad hair-scales . . . . . *Naupactosis*.
- 67 (66). Tarsal grooves bare. Eyes strongly convex. Elytra among the sparse appressed scales with long erect hairs . . . . . *Trichocyphus*.
- 68 (65). Only the front tibiae rather finely denticulate on inner edge. Tarsal grooves bare. Eyes strongly convex. Elytra largely bare, only to a small extent covered with appressed scales, towards the apex with some long erect hairs . . . . . *Amisus*.

15 Marshall, 1936, Bull. ent. Res. xxix, p. 1.

- 69 (6). Shoulders absent, rarely rather broadly rounded, only the apex of the elytra with long erect hairs.
- 70 (71). Shoulders broadly rounded. Antennal club hardly more than twice as long as wide; scape not quite reaching hind margin of eye. Corbels ascending by slightly more than the apical width of the tibia, the dorsal surface of the tibiae with a slight obtuse dilatation at the end of the ascending setae ..... *Cuneophorus*.
- 71 (70). Shoulders absent.
- 72 (73). Scutellum very broadly inverted-triangular, posterior truncature forming an almost straight line. Fore and mid-femora toothed; fore tibiae not denticulate on inner edge. Corbels shortly ascending ..... *Cleistolophus*.
- 73 (72). Scutellum normal, triangular or indistinct. Femora unarmed.
- 74 (75). Inner edge of front tibiae not denticulate. Frons with a deep and broad transverse pit that almost reaches the eyes; nasale very well defined; rostrum with three deep longitudinal furrows. Sculpture as in many *Epicærus*, corbels very narrowly enclosed<sup>16</sup> ..... *Glaephyrometopus*.
- 75 (74). Inner edge of front tibiae denticulate. Frons normal.
- 76 (77). Front coxae completely separated. Second funicular joint much longer than first. Inner edge of front tibiae with strong denticles, that of the middle and, to a lesser degree, that of the hind tibiae with a row of immovable spines; corbels ascending a long way. Scutellum indistinct ..... *Pseudopantomorus*.
- 77 (76). Front coxae contiguous or at least not separated by contiguous processes of the prosternum<sup>17</sup>. Mid- and hind tibiae without a row of spines, but sometimes with a row of strong setae... *Pantomorus*<sup>18</sup>... 78
- 78 (79). Basal margin of elytra more or less strongly, often sharply raised ..... [s. str.]
- 79 (78). Basal margin of elytra not keeled or at most with a slight keel at sides. Sbg. *Pantomorus*,

<sup>16</sup> The facies of this genus is suggestive of many *Epicærus*, and the very narrowly enclosed corbels are reminiscent of many Barynotini, in which tribe the genus is probably placed more correctly. Head and rostrum, however, present the characters of the Naupactini.

<sup>17</sup> Rostrum separated from frons by a shallow transverse furrow; frons with a tubercle above each eye that hides the latter in dorsal aspect: *Calypstillus*, see Barynotini.

<sup>18</sup> The North American subgenera and species of this genus have recently been studied by Buchanan (1939, U.S. Dept. Agric. Misc. Publ. 341), and the above key to the subgenera has been adapted from his paper.

- 80 (81). Mandibles with a shallow groove, bounded on each side by a blunt carina, and running from lower edge of scar to lower edge of mandible; support of deciduous appendage short. Scutellum densely clothed with contrasting scales. Elytral setæ erect and conspicuous throughout; each elytron with a contrasting humeral stripe. . . . Sbg. \**Graphognathus*.<sup>[thus 16.]</sup>
- 81 (80). Mandibles without a groove between scar and lower edge, though sometimes with a distinct carina (the inner one of *Graphognathus*).
- 82 (83). Elytral setæ erect or suberect throughout. Corbels more broadly enclosed, ascending by about half the apical width of the tibiae, the latter widened apically. Basal part of spermatheca broad, not produced . . . . . Sbg. *Phaecepholis*.
- 83 (82). Elytral setæ more or less prostrate on basal half. Corbels narrowly enclosed to open, ascending by the apical width of the tibia or more, the latter only slightly widened apically. Basal portion of spermatheca rather slender and more or less produced.
- 84 (85). Eye moderately convex, the outer margin in dorsal view evenly curved. Support of deciduous appendage barely elevated. First funicular joint equal to or longer than second. Median groove of head not or hardly exceeding hind margin of eyes. Basal margin of elytra not thickened; elytral setæ prostrate or subprostrate nearly throughout. Spermatheca slightly produced basally . . . . . Sbg. \**Atrichopus*.<sup>[notus 16.]</sup>
- 85 (84). Eye strongly convex, the curvature of the outer margin in dorsal view steeper posteriorly than anteriorly. Support of deciduous appendage distinctly elevated. First funicular joint shorter than second. Median groove of head exceeding eyes. Basal margin of elytra usually somewhat thickened at sides; elytral setæ erect or slanting on apical half. Spermatheca greatly produced basally.
- 86 (87). Corbels enclosed and squamose. Tenth stria of elytra obsolete in middle part. Intercostal process of abdomen distinctly narrower than a hind coxa; vestiture of the ventrites subevenly distributed. Duct of spermatheca sclerotised . . . . . Sbg. *Aramidius*.
- 87 (86). Corbels open or virtually so. Tenth stria of elytra complete. Intercostal process of abdomen as wide as a hind coxa; vestiture of the ventrites abruptly finer and sparser on a broad

- median stripe. Duct of spermatheca membranous . . . . . Shg. *Asynonychus*.
- 88 (5). Corbels open <sup>19</sup>.
- 89 (99). Front coxæ not completely separated <sup>20</sup>.
- 90 (91). Shoulders quite absent. Elytra ovate. [ *Asynonychus* <sup>21</sup>.  
*Pantomorus* shg.
- 91 (90). Shoulders indicated or well developed.
- 92 (93, 94). Dorsal surface covered with scales and erect setæ. Shoulders broadly rounded . . . . . *Mesagroicus*.
- 93 (92, 94). Dorsal surface without scales but with longer erect and shorter appressed hairs, even on the pronotum, head and antennæ . . . . . \* *Trichonaspactus* <sup>22</sup>.
- 94 (92, 93). Dorsal surface bare or squamose, at most with almost appressed hair-scales among the scales or with erect setules at apex.
- 95 (98). Dorsal surface densely squamose.
- 96 (97). Third tarsal joint not or slightly wider than the preceding ones. Shoulders well developed . . . . . *Eurymetopus*.
- 97 (96). Third tarsal joint much wider than the preceding ones. Shoulders broadly rounded . . . . . *Lepidocricus* <sup>22</sup>.
- 98 (95). Dorsal surface bare but for the apex of the elytra <sup>24</sup>. Third tarsal joint much wider than the preceding ones. Shoulders narrower than the elytra behind middle . . . . . *Melanocyphus*.
- 99 (89). Front coxæ completely separated by contiguous or fused processes of the ventral sclerite of the prothorax. Dorsal surface without scales <sup>25</sup>.
- 100 (101). Dorsal surface with sparse erect hairs. Shoulders weakly developed. Pro-

<sup>19</sup> The description of \**Pactorrhinus* Ancey leaves no doubt that it belongs to the Naupactini. Genus and species have never since been recognised in spite of the intense study that has been devoted to the fauna of the United States. Perhaps the open corbels are an erroneous statement; in this case the description would fit *Cyphus laetus*.

<sup>20</sup> With weakly developed vibrissæ, which may sometimes be entirely missing, and the hind coxæ not broader than the mid-coxæ and separated by the combined length of the first two abdominal segments: see *Minyomerus* (Tanymecina).

<sup>21</sup> I am unable to distinguish *Antelnia* from the *Pantomorus*-species with open corbels. Sir Guy Marshall suggests the separation of these species from *Pantomorus* as a separate genus, *Asynonychus*. The above key (paragraphs 77-90) tries to follow an intermediate course between this suggestion and Buchanan's procedure of synonymising *Aramigus* and *Asynonychus*.

<sup>22</sup> Hustache, 1939, An. Soc. cient. Argent. cxxviii. p. 45.

<sup>23</sup> = *Mesagroicus*, group I, of Buchanan.

<sup>24</sup> Dorsal surface apparently largely bare, with squamose longitudinal vittæ. Elytra largest somewhat in front of middle: \**Myocyphus* Hustache, 1939, An. Soc. cient. Argent. cxxviii. p. 38.

<sup>25</sup> Dorsal surface squamose: see Tanymecina, some genera related with *Pandelestus*, in which the vibrissæ are often almost or wholly

notum smooth, rather slightly narrower than the shoulders. Inner surface of mid- and hind tibiae not denticulate .....

*Eurymetopellus.*

- 101 (100). Dorsal surface bare. Shoulders absent. Prothorax subglobular, strongly tuberculate, much wider than the base of the elytra. Inner surface of mid-tibiae denticulate .....

*Teratopactus.*

### 3. *Barynotini.*

- 1 (68). Apex of front tibiae not or only very slightly produced (and rounded) exteriorly.

- 2 (7). Head strongly constricted behind eyes, the latter very strongly prominent and the summit of their convexity shifted posteriorly, the eyes almost somewhat overhanging the constriction. Shoulders well developed, much wider than prothorax, or at least distinctly prominent, though rounded, in this case the front femora strongly toothed.

- 3 (4). Corbels open. Antennal scape exceeding hind margin of eye. Front femora toothed, front tibiae strongly denticulate. Shoulders rounded off; ninth and tenth striae confluent at basal third .....

*Apotomoderes.*

- 4 (3). Corbels enclosed, bare. Shoulders much wider than the prothorax.

- 5 (6). Front femora toothed. Ninth and tenth striae very closely adjacent in intermediate third. Tibiae not denticulate .....

*Ischionoplus.*

- 6 (5). Femora unarmed. Ninth and tenth striae not more closely adjacent in intermediate than in apical third, about half as distant from each other as the eighth and ninth. All the tibiae strongly denticulate interiorly ..

*Tetrabothynus.*

- 7 (2). Head not or only slightly constricted behind the eyes; if rather strongly constricted the femora unarmed and the shoulders only slightly wider than prothorax. Eyes as a rule only moderately convex and not much projecting, seldom overhanging temples.

- 8 (21). Shoulders well developed, much wider than prothorax, sometimes broadly rounded and shifted to about the basal third. If they are hardly wider than the prothorax or broadly rounded the elytra narrowed from the very shoulders onwards and the wings present. First segment of the antennal club cuplike, about as long to one and a half times as long as wide, as long



or at the most half as long again as the second<sup>16</sup>. Corbels open, indistinctly enclosed or distinctly enclosed<sup>17</sup>. Front coxæ separated only by processes of the prothorax, which are not contiguous<sup>18</sup>.

- 9 (20). Corbels bare.
- 10 (17). Frons, between the eyes, conspicuously narrower than the dorsal surface of the rostrum.
- 11 (16). Femora unarmed, at most with fine granules on the ventral surface; all the tibiæ denticulate, though sometimes very finely.
- 12 (13). Shoulders hardly wider than the base of the prothorax. Rostrum everywhere weakly and evenly convex. Antennal scape slightly passing middle of eye ..... *Lachnopus*.
- 13 (12). Shoulders broadly rounded or prominent, considerably wider than the base of the prothorax. Rostrum slanting to apex.
- 14 (15). Antennal scape passing hind margin of eye ..... *Chauliopleurus*.
- 15 (14). Antennal scape hardly reaching hind margin of eye ..... *Decusticha*.
- 16 (11). Femora toothed. Tibiæ not denticulate. Shoulders much wider than the base of the prothorax. Dorso-apical part of rostrum smoothened and slanting for a considerable distance. Corbels narrowly though distinctly enclosed.. *Clæoteges*.
- 17 (10). Frons as wide as the dorsal surface of the rostrum. Femora unarmed.
- 18 (19). Antennal scape not passing middle of eyes. Shoulders very much wider than base of prothorax. Corbels enclosed but linear. Front tibiæ with sparse fine denticles, mid- and hind tibiæ unarmed on inner surface..... *Pseudomelactus*.
- 19 (18). Antennal scape passing hind margin of eyes. Shoulders somewhat removed from base and tuberculiform. Corbels more broadly enclosed. Inner surface of all the tibiæ finely denticulate towards apex ..... *Lyperobates*.
- 20 (9). Corbels hairy or squamose, broadly enclosed. Frons between the eyes as

<sup>16</sup> First segment of the antennal club truncate-subconical, almost twice as long as wide and about twice as long as the second: *Paræxophthalmus* probably belonging, like *Prepodes*, to the Leptopinæ.

<sup>17</sup> The same applies to *Rhinospathe*, *Prepodes* (= *Exophthalmodes*) and *Eustales*, in which the antennal scape distinctly covers the lower part of the eyes. These genera are therefore placed in the Leptopinæ or, perhaps, Otiorrhynchinæ.

<sup>18</sup> Front coxæ completely separated by fused processes of the prothorax. Nasal plate sharply defined and very large: *Polydacrys* of the Tanymericini (vibrissæ often missing).

- wide as the dorsal surface of the rostrum, the latter short, evenly convex, the apex deeply excised on a triangular area . . . . . *Emmeria*.
- 21 (8). Shoulders absent or broadly rounded, elytra in that region not or slightly wider than the base of the prothorax and always narrower or at least not wider than in or behind middle.
- 22 (25). Corbels open.
- 23 (24). Rostrum with a glabrous triangular nasal plate and a long median keel, usually the side margin of the rostrum also slightly keeled, rostrum almost always separated from frons by a depression or furrow . . . . . *Pronasyleus*.
- 24 (23). Rostrum without a glabrous nasal plate<sup>99</sup> and a median keel. Third tarsal joint bilobed and broader than second. Maxillæ incompletely covered by mentum. First and second ventrites connate, the suture obliterated in middle . . . . . *\*Sterrogaster*.
- 25 (22). Corbels distinctly, though often narrowly, enclosed.
- 26 (27). Rostrum separated from frons by a shallow transverse furrow; frons above each eye with a small tubercle that largely covers the eye in dorsal aspect. Third tarsal joint only slightly emarginate, not wider than second. Maxillæ incompletely covered by mentum . . . . . *Calypillus*.
- 27 (26). Rostrum not separated from frons.
- 28 (33). Mesoepipimera more triangular, their anterior margin running straight to the angle between elytra and peduncle of mesothorax, the mesoepipisterna therefore at the most very narrowly contiguous with the side margin of the elytra. Femora unarmed. Scutellum well developed.
- 29 (32). Tarsal grooves bare; corbels very narrowly enclosed. The dorso-apical part of the rostrum slanting.
- 30 (31). Nasal plate present but not deepened. Corbels bare. Antennal scape reaching or exceeding hind margin of eyes. . . . *Naupactopsis*.
- 31 (30). Nasal plate absent. Corbels not bare. Antennal scape not reaching hind margin of eyes. Hind tibiae of male densely haired on inner side. . . . . *Onemotricha*.
- 32 (29). Tarsal grooves squamose; corbels broadly enclosed, haired. Tenth elytral stria present only in basal third. The dorso-apical part of the rostrum

<sup>99</sup> Rostrum without a sharply defined nasal plate, not separated from frons. Antennal scape covering the lower part of the eye in resting position: *Oelandius* (Otiorrhynchinae).

- triangularly deepened only on median part in the region of the nasal plate. . . . . *Omitous*.
- 33 (28). Mesepimera approximately short-trapezoidal, the anterior margin running to the side margin of the elytra and there turning slightly forward, so that the mesoepisterna (seem to) touch the elytra as a broad strip.
- 34 (39). Tarsal grooves squamose; corbels rather broadly enclosed. Antennae densely squamose between the longer hairs, not shining.
- 35 (38). Femora unarmed. Scutellum normal. Head not distinctly constricted behind eyes.
- 36 (37). Pronotum with two oblong bare, shining foveoles on the median line . . . . . *Mazenae*.
- 37 (36). Pronotum uniformly squamose, without foveoles<sup>20</sup>.
- 38 (35). Femora toothed or at least tuberculate. Scutellum small. Head somewhat constricted behind the eyes . . . . . *Eumestorus*
- 39 (34). Tarsal grooves bare. Scutellum small or absent.
- 40 (63). Rostrum short, not or hardly longer (without the mandibles) than wide, including the pterygia (to be measured). America.
- 41 (44). Femora toothed.
- 42 (43). Hind margin of eyes contiguous with front margin of prothorax; eyes strongly convex, especially in posterior half . . . . . *Maseorrhynchus*.
- 43 (42). Eyes separated from front margin of prothorax by more than half their longest diameter<sup>21</sup>, moderately convex. *Bisfomicrus*.
- 44 (41). Femora unarmed.
- 45 (48). Head strongly constricted behind eyes, which protrude strongly and overhang the temples distinctly. Rostrum short, strongly convex longitudinally.
- 46 (47). Pterygia not visible from above . . . . . *Sciorrhinus*.
- 47 (46). Pterygia visible from above. . . . . \* *Bradyrrhynchoidea*
- 48 (45). Head not constricted behind the eyes, which are moderately convex and do not overhang the temples. Pterygia more or less visible in dorsal aspect.
- 49 (54). Rostrum very short and broad, wider, including pterygia, than long; the latter fully visible in dorsal aspect.
- 50 (53). Antennal scrobes soon becoming shallow posteriorly, their dorsal edge quite obtuse behind, its sharp part directed rather towards middle of eye. Base

<sup>20</sup> Pronotum uniformly squamose and antennal scrobes directed to the lower part of the eyes: *Brachyomus* (Otiorrhynchinae).

<sup>21</sup> Eyes not contiguous with front margin of prothorax. Rostrum slightly longer than wide. Antennal scrobe directed towards the lower part of the eye: *Epitosus* (Otiorrhynchinae).

- of elytra wider than that of prothorax ; shoulders broadly rounded.
- 51 (52). Dorsal-apical part of rostrum without a transverse callosity ..... *Deamphus*.
- 52 (51). Dorsal-apical part of rostrum behind the base of the antennæ with a transverse callosity ..... *Pycnophitus*.
- 53 (50). Antennal scrobes deep to near eyes, the dorsal edge sharp, directed to the lower margin of the eyes. .... *Epagrius*.
- 54 (49). Rostrum, including pterygia, almost as long as wide or slightly longer.
- 55 (56). Rostrum behind the nasale with a large glabrous and shining area. Eyes distant from front margin of prothorax by more than half their longest diameter. Base of elytra exactly as wide as that of prothorax ; shoulders absent ..... *Stamoderes*.
- 56 (55). Rostrum squamose behind the nasale and not more shining than the rest of the dorsal surface. Eyes distant from front margin of prothorax by half their longest diameter or less. Base of elytra as a rule distinctly somewhat wider than that of prothorax. Rostrum to the inner side of the dorso-lateral margin with a very distinct longitudinal impression.
- 57 (60). Antennæ more slender, funicular joints conical, the last of them free. .... *Epicærus*..... 58.
- 58 (59). Corbels broadly enclosed, squamose. Antennal scrobes narrow ..... Sbg. *Epicærus*, s. str.
- 59 (58). Corbels narrowly enclosed, bare. Antennal scrobes wider ..... Sbg. *Diorynotus*.
- 60 (57). Antennæ stout, last funicular joint short, broad and tightly fitted to the club. The alternating intervals of the elytra raised.
- 61 (62). Frons without a pit. Eyes somewhat encroaching upon dorsal surface, frons therefore narrower than rostrum .... *Graphorrhinus*.
- 62 (61). Frons with a deep transverse pit that almost reaches the eyes, the latter quite lateral, and the frons therefore wider than the rostrum<sup>22</sup>; the latter with a deep median longitudinal groove ..... *Glaphyrometopus*.
- 63 (40). Rostrum rather long, at least slightly longer (without the mandibles) than wide, including the pterygia. Femora unarmed. Antennæ at most finely and sparsely squamose between the longer hairs, glossy. Europe, North Africa.

<sup>22</sup> This character distinguishes the Naupactini from the Barynotini, so that it would bring *Glaphyrometopus* into the former tribe. Otherwise, however, this genus seems to join quite closely the allies of *Epicærus*.

- 64 (65). *Metaepisterna* separated from *meta-*  
sternum by a distinct suture. Pro-  
sternum unarmed behind coxæ. Each  
of the punctures of the elytral stria  
with a small round scale. . . . . *Geonemus.*
- 65 (64). *Metaepisterna* fused with *meta-*  
sternum in most of their length without leaving  
a suture. Prosternum behind the front  
coxæ with two closely adjacent  
tubercles, which are often fused into  
a transverse tubercle. Each of the  
punctures of the elytral stria with a  
fine short hair . . . . . *Barynotus*. . . . . 66.
- 66 (67). Base of elytra forming a small tooth  
exteriorly. Second funicular joint not  
longer than wide, almost identical  
with the third . . . . . Sbg. \**Kissodontus.*
- 67 (66). Base of elytra rounded exteriorly.  
Second funicular joint longer than  
wide, much longer than third . . . . . Sbg. *Barynotus*, s. str.
- 68 (1). Apex of front tibiae strongly dilated  
exteriorly and interiorly. Elytra with  
broadly rounded shoulders. Corbels  
enclosed. Antennal scape somewhat  
exceeding hind margin of eye.
- 69 (70). Rostrum not separated from head,  
much wider than long. Corbels bare,  
obliquely convex, the inner edge with  
the normal row of spinules, the outer  
one with several confused rows of  
overlapping stronger setules; tarsal  
grooves bare, not occupying the whole  
of the apico-internal surface of the  
tibiae . . . . . *Anomonychus.*
- 70 (69). Rostrum separated from head by a fine  
transverse groove, as long as wide.  
Corbels squamose.
- 71 (72). Corbels convex in anterior half, the  
outer angle produced; tarsal grooves  
bare, only shallowly excavate . . . . . \**Ptenaschopsis.*
- 72 (71). Corbels obliquely concave, the outer  
angle not produced; tarsal grooves  
squamose . . . . . *Trigonoscuta.*

#### 4. *Psalidiini.*

Only the genus *Psalidium*, with two not very sharply  
defined subgenera, *Cæliopus* and *Axyræus*.

#### 5. *Cratopini.*

- 1 (14). Winged; elytra slightly or not nar-  
rowed to base.
- 2 (3). Antennal scape not reaching middle of  
eye; the latter having a subconical  
convexity, the summit of which lies  
somewhat beyond middle. Femora  
unarmed. Corbels enclosed . . . . . *Lujacella.*

- 3 (2). Antennal scape reaching or passing middle of eyes.
- 4 (13). Antennal scape at the most only just passing hind margin of eyes.
- 5 (10). Base of elytra conspicuously wider than that of prothorax, the shoulders therefore strongly prominent even though rounded. Fore legs not much enlarged.
- 6 (7). Corbels open. Lateral surface of prothorax simple ..... *Scutivinus*.
- 7 (6). Corbels enclosed.
- 8 (9). Sides of prothorax produced posteriorly into a tooth, the base being suddenly and very strongly constricted ..... *Zyrcostoides*.
- 9 (8). Prothorax subcylindrical, its sides only slightly rounded ..... \**Afropolydrosus* <sup>22</sup>.
- 10 (5). Base of elytra only slightly wider than that of prothorax, the shoulders not very prominent.
- 11 (12). Inner edge of front tibiae distinctly denticulate ..... *Stianus*.
- 12 (11). Inner edge of front tibiae smooth ..... \**Afrocratopus* <sup>24</sup>.
- 13 (4). Antennal scape reaching about front margin of prothorax ..... *Cratopus*.
- 14 (1). Apterous; elytra strongly narrowed to base, without shoulders.
- 15 (16). Antennal scape reaching front margin of prothorax ..... *Cratopopsis*.
- 16 (15). Antennal scape far exceeding front margin of prothorax, very slender. Front legs not much enlarged, femora unarmed. Head constricted by a postocular furrow; the eyes with a somewhat excentric convexity, rounded-conical ..... *Pseudiphisus*.

#### 6. *Polydrosini*.

- 1 (18) Corbels open. Wings and shoulders usually well developed.
- 2 (3). Rostrum very short and broad, the apex with a large smooth area which is surrounded by a semicircular callosity. Eyes small, convex, lateral and even somewhat removed from dorsal margin if seen in lateral view. Maxillæ incompletely covered by mentum ..... *Scythropus*.
- 3 (2). Rostrum not or slightly shorter than wide, without a smooth apical area

<sup>22</sup> Hustache, 1939, Explor. Parc Nat. Albert, Miss. de Witte, 1933/35, xxviii. p. 16. It is obvious from the description that *Afropolydrosus* cannot be included in the *Polydrosini* as defined above because of the enlarged front femora and the enclosed corbels. The latter are said to be "faussement caverneuses," but their description on p. 16 makes it quite clear that the genus has enclosed corbels.

<sup>24</sup> Hustache, 1938, Atti Mus. Stor. nat. Trieste, xiv. p. 87.

- which is defined by a callosity.  
Maxillæ more or less completely hidden.
- 4 (17). Rostrum narrower than head. Body covered with very small scales or with hairs.
- 5 (16). Head squamose, hairy or punctate. Femora simple or toothed. Body usually squamose or hairy.
- 6 (11). Wings well developed; shoulders usually strongly prominent.
- 7 (8). Tenth stria of the elytra complete. Prothorax rounded at sides, basal margin straight or very slightly bisinuate ..... *Polydrosus*.
- 8 (7). Tenth stria of the elytra shortened.
- 9 (10). Prothorax subconical, with quite straight sides; basal margin very deeply bisinuate. Head without a conspicuous median furrow; nasal plate short. Fifth interval of the elytra simple ... *Polydrosodes*.
- 10 (9). Prothorax subcylindrical, only the anterior third slightly narrowed, the base hardly bisinuate. Head with a long and deep median furrow; nasal plate large. Fifth interval of the elytra raised at apex to form a quite conspicuous callosity ..... *Apodrosus*.
- 11 (6). Wings absent or vestigial, not functional; shoulders broadly rounded or rather narrow<sup>22</sup>.
- 12 (13). Second and third ventrites of subequal length. Hind coxæ widely separated. Shoulders prominent though narrow. .... *Cautoderus*.
- 13 (12). Third ventrite much shorter than second. Hind coxæ rather narrowly separated. Shoulders broadly rounded; wings vestigial.
- 14 (15). Hind coxæ separated by less than half the width of a hind coxa. Antennal scrobes evenly curved. Scutellum almost square ..... *Sciadrusus*.
- 15 (14). Hind coxæ separated by at least the width of a hind coxa. Antennal scrobes rather markedly angulate. Scutellum more than twice as wide as long ..... *Pythis*.
- 16 (5). Head and rostrum with closely placed punctures, which coalesce into dense longitudinal striae. Femora unarmed. Body with very sparse short hair scales or almost glabrous. Prothorax very little narrower than the elytra, transverse ..... *Homapterus*.
- 17 (4). Rostrum broad, not narrower than head, with a longitudinal groove. Head and rostrum evenly and slightly

<sup>22</sup> \**Morederia* Reitt will probably belong to this group. The temples are long, the legs stout, the body hairy without scales. Reitter does not describe the wings and ventrites.

- narrowed, somewhat conical. Prothorax hardly transverse, narrower than the elytra, rounded at sides. Dorsal surface covered with large, rounded, well separated scales . . . . . *Sitonapterus*.
- 18 (1). Corbels semi-enclosed. Body stout, without wings. Elytra strongly dilated from the shoulders to beyond middle. *Liophlaeus* . . . . . 19.
- 19 (20). Shoulders well developed. Metasternum between the coxal cavities as long as the mid-coxae . . . . . Sbg. *Liophlaeus*, s. str.
- 20 (19). Shoulders very small. Metasternum between the coxal cavities much shorter than the mid-coxae . . . . . Sbg. *Liophlaeodes*.

### 7. *Brachyderini* <sup>26</sup>.

- 1 (2). Corbels ascending by more than the apical width of the tibiae, the ascending part forming a distinct, not very obtuse angle with the apical part. Dorsal surface of rostrum narrowed anteriorly; nasal plate not defined . . *Brachyderes*.
- 2 (1). Corbels not ascending, or ascending by less than the apical width of the tibiae, the ascending part in this case rounded or meeting the apical part in a very obtuse angle <sup>27</sup>.
- 3 (33). Apex of rostrum without a distinct genuine or spurious nasal plate, though sometimes with a smooth deepened area, but the latter not defined by a keel posteriorly. If the antennal scape does not distinctly exceed the hind margin of the eyes the posterior boundary of a nasal plate not even indicated.
- 4 (5). The temples almost as long as the (transverse) prothorax in median line; head very large and broad, as wide as or wider than the pronotum . . . . . *Edmundia*.
- 5 (4). Temples much shorter than prothorax on median line.
- 6 (10). Antennal scape not exceeding hind margin of eyes.
- 7 (8, 9). Funiculus only slightly longer than scape. Femora finely dentate . . . . . *Pleurodirus*.

<sup>26</sup> If I am right in assuming from the description that *Trachyphlaeocetus* does not belong to the (Otiorrhynchinae, but to the Brachyderinae, its place can only be in the Brachyderini. However, it is impossible to incorporate the genus in this key from the description. Important characters are the "frons angulatum sulcata" and the long antennal scape, which reaches front margin of prothorax. *Doehorhynchus* also belongs to the Brachyderini, if to the Brachyderinae at all.

<sup>27</sup> Eyes bluntly conical: cf. Strophosomini, among which some *Strophomorphus*, etc., have the temples indistinctly constricted. Not bluntly conical but strongly unevenly (eccentrically) convex eyes are found in *Synaptorrhinus*, which I include in the Brachyderini.



- 8 (7, 9). Funiculus about one and a half times as long as scape. Femora unarmed. Scape hardly reaching middle of eyes. The first two tarsal joints broad and short, so that the third joint of the hind tarsi is only very little wider than the first. .... *Synechops*.
- 9 (7, 8). Funiculus almost twice as long as scape. Femora unarmed ..... *Paophilus*.
- 10 (6). Antennal scape far exceeding hind margin of eyes.
- 11 (22). Tarsi not very slender, the first joint of the hind tarsi (without the condylus) less than twice as long as wide, much shorter than the following two together.
- 12 (15). Body not squamose, shining, with only appressed hairs.
- 13 (14). Rostrum not separated from frons. .... *Barypithes*.
- 14 (13). Rostrum separated from frons by a transverse impression ..... *Chilodromus*.
- 15 (12). Body squamose with or without interspersed small erect hairs<sup>28</sup>.
- 16 (17). Elytra ovate, with numerous rather long erect hairs ..... *Pseudopterus*.
- 17 (16). Elytra very shortly elliptical, with hairs which are sparse or distinctly erect only towards apex.
- 18 (21). Intercostal process of abdomen much narrower than a hind coxa. Shoulders simply rounded.
- 19 (20). Antennal scape reaching about middle of eyes; scrobes quite lateral. .... *Synaptorrhinus*.
- 20 (19). Antennal scape passing front margin of prothorax; anterior part of scrobes lying on the dorso-lateral surface of the rostrum ..... *Cyclomias*.
- 21 (18). Intercostal process of abdomen almost twice as wide as a hind coxa. Shoulders rounded, with a prominent tubercle ..... *Tapinomorphus*.
- 22 (11). Tarsi slender, the first joint of the hind tarsi (without the condylus) twice or more than twice as long as wide, about as long as the two following joints together.
- 23 (32). Apex of rostrum only slightly emarginate. Mandibles, antennal funiculus and dorsal surface of tarsi without or with sparse metallic hairs.
- 24 (25). Femora dentate (sometimes very finely so) ..... *Eusomus*<sup>29</sup>.
- 25 (24). Femora unarmed.
- 26 (29). Abdomen only finely haired, without scales.

<sup>28</sup> Shoulders indicated even though very little wider than the base of the prothorax: *Liophlaeodes* (a subgenus of *Liophlana*) and *Hemapterus* of the Polydrosini.

<sup>29</sup> Including *Euidosomus*. The genera *Sciomias* to *Mitostylus* also are hardly more than subgenera of *Eusomus*.

- 27 (28). Antennal scrobes strongly curved downward, remaining separated from the eyes by at least twice their own width. Rostrum very short ..... *Sciomias*.
- 28 (27). Antennal scrobes not very strongly curved downwards, remaining separated from the eyes by about their own width ..... *Ameladus*.
- 29 (26). Abdomen with hairs and scales.
- 30 (31). Eyes distant from front margin of prothorax by about their own length. Rostrum about as long as wide ..... *Chastopantus*.
- 31 (30). Eyes distant from front margin of prothorax by hardly half their shortest diameter. Rostrum wider than long . *Mitostylus*.
- 32 (23). Apex of rostrum with a deep triangular excision. Mandibles, antennal funiculus and dorsal surface of tarsi with fine metallic hair-scales between the non-metallic hairs ..... *Epiphaneus*.
- 33 (3). Apex of rostrum with a distinct nasal plate, which is defined even posteriorly in middle by a more or less sharp keel, or with a sharply defined spurious nasal plate (see paragraph 55).
- 34 (37, 58). Tarsi very slender, the first joint of the hind tarsi as long as or somewhat longer than the combined length of the second and third and more than twice as long as wide. Femora unarmed.
- 35 (36). Antennal scape not much exceeding hind margin of eyes, funiculus almost twice as long as scape. Nasal plate semicircular, defined by a keel ..... *Eusomatulus*.
- 36 (35). Antennal scape exceeding front margin of prothorax, funiculus only slightly longer than scape. Nasal plate triangular ..... *Deroecinus*.
- 37 (34, 56). Tarsi normal, first joint of hind tarsi almost as long as the combined length of the second and third, about twice or almost twice as long as wide.
- 38 (41). Antennal scape not quite reaching hind margin of eyes.
- 39 (40). Ventral surface squamose, like the dorsal surface. Femora, especially the hind ones, usually with a fine tooth. Antennal scape reaching about middle of eyes ..... *Sciaphobus* <sup>40</sup>.
- 40 (39). Ventral surface only with some narrow scales near median line, otherwise shining and with sparse fine hairs. Femora unarmed. Antennal scape almost reaching hind margin of eyes . *Stasioides*.
- 41 (38). Antennal scape distinctly exceeding hind margin of eyes.

<sup>40</sup> Including *Neosciaphobus*.

- 42 (55). Apex of rostrum with a genuine triangular nasal plate which does not occupy the whole of the anterior margin.
- 43 (44). Outline of the elytra somewhat concave between shoulder region and base. Femora unarmed. Eyes strongly convex ..... *Chlorastus*.
- 44 (43). Outline of the elytra convex between shoulder region and base <sup>41</sup>.
- 45 (50). Femora toothed, though sometimes very finely so.
- 46 (49). Elytra with rows of erect setae between the scales.
- 47 (48). Elytra ovate to short-ovate. Dorsal surface of rostrum with a fine longitudinal median keel ..... *Sciaphilus*.
- 48 (47). Elytra long-ovate. Dorsal surface of rostrum with a fine longitudinal median groove ..... *Dinus*.
- 49 (46). Elytra without rows of erect setae between the scales, ovate to long-ovate. Scutellum distinct. Antennal scrobe almost entirely lateral. .... *Sericophotus* <sup>42</sup>.
- 50 (45). Femora unarmed.
- 51 (54). Nasal plate only emarginate or shallowly excised in front, occupying essentially a triangular area.
- 52 (53). Elytra long-ovate. Antennal scrobes almost entirely lateral. Body of median size ..... *Photocoars*.
- 53 (52). Elytra short-ovate. Anterior part of antennal scrobes encroaching upon latero-dorsal surface of rostrum. Body very small ..... *Brachysomus*.
- 54 (51). Nasal plate deeply and broadly excised in front, so that only a narrow part of it is preserved, though this is defined by a sharp keel outwardly. Temples narrowed posteriorly, almost somewhat constricted. .... *Achradidius*.
- 55 (42). Apex of rostrum without a genuine nasal plate but instead with a spurious one which laterally reaches the margin of the dorsal surface of rostrum and posteriorly the level of the antennal insertions, and which is defined posteriorly by a keel.
- 56 (57). Body squamose ..... *Chilonus*.
- 57 (56). Body hairy, the hair of the pronotum transversely directed and appressed.

<sup>41</sup> This paragraph also applies to "*Cyrtops*" *pilosulus* Hust. from Madagascar and to *Allopyrtops* (Hustache, 1939, Bull. Acad. malg. (N.S.) xxi, p. 6), also from Madagascar. The latter is distinguished from the former by a distinct scutellum and the second ventrite, which is shorter than the combined length of the third and fourth, but longer than the third.

<sup>42</sup> I am unable to separate *Alophinus* generically from *Sericophotus*, though the species are distinct.

- Rostrum very short. Femora unarmed . . . . .
- 58 (34, 37). Tarsi stout, the first joint of the hind tarsi not much longer than wide, much shorter than the combined length of the second and third joints.
- 59 (60). Antennal scape normal, funiculus and dorsal surface of tarsi very densely squamose. Third joint of hind tarsi hardly wider than the preceding ones. Rostrum not separated from frons. Body elongate . . . . .
- 60 (59). At least the apical third of the antennal scape strongly dilated, funiculus and dorsal surface of tarsi without or with sparse scales between the hairs, shining. Third tarsal joint distinctly wider than the preceding ones. Body very stout. Rostrum separated from frons by a deeply engraved angulate transverse groove.
- 61 (62). The basal two-thirds of the antennal scape very slender, the apical third suddenly clubbed. Tarsi normal, third joint much wider than the preceding ones . . . . .
- 62 (61). The antennal scape strongly dilated and flattened in its entire length. All the tarsal joints very broad, the third distinctly, though not much, wider than the preceding ones . . . . .

\**Chilonorrhinus*.*Epiphonops*.*Hypsomia*.*Platycoptes*.

(To be continued.)

XLVIII. *Myriapoda (Chilopoda and Diplopoda) from Cornwall, with Notes and Descriptions of Forms new to the British Fauna.* By F. A. TURK, Ph.D., F.R.E.S., F.Z.S.

Two previous authors, separated by nearly a hundred years, have dealt with the myriapod fauna of Cornwall. My friend, H. J. Larwood, M.Sc., in a recent number of these 'Annals' (1941), wrote on a small collection of Chilopods from Cornwall. This paper recorded a subspecies new to the British Isles, but the material was collected from a small and limited locality. At the commencement of his paper he mentions the work of the previous author, W. P. Cocks (1851). The list of Myriapods given in this paper by Cocks was, in fact, practically the same as that recorded in an earlier paper (1849) by the same author, although some significant changes, which will be mentioned later under the respective species, were made.

The material on which the present paper is founded has been collected over a period of nearly four years, and represents collections made at several widely-scattered points in the county. For much of this material I have to thank especially the following, who have collected in the districts named:— Mr. H. C. Fountain, F.Z.S. (Polbathic, St. Germans. Tuckingmill): Miss Stella-Maris Phillips, F.Z.S. (Feock, Truro and St. Just-in-Roseland districts): Miss Marion Hocken, F.Z.S., F.R.E.S. (St. Ives and St. Erth). I have also to thank the Rev. Dr. Graham Brade-Birks, D.Sc., who kindly presented me with several of his papers when I first began these studies in 1940.

It has not seemed necessary to give a synonymy of each species; where possible the nomenclature followed has been that of Brade-Birks' two lists (1934 and 1939), and for forms not included in those lists I have relied, for the most part, on the works of Brolemann (1923, 1932, 1935) and of Berlese (1886).

In the study of the Chilopod material I have had the advantage of having before me the actual specimens described by Larwood, including a number of microscopical preparations, and of my own material I have made several dissections and mounts, and, of some species, I have been fortunate in having a long series of specimens for comparison.

Of the Diplopods no species has been recorded unless at least one male specimen was available for the dissection of the gonopods, except in the very few cases where no male was available, when the vulvæ of at least one (generally several) females have been dissected and mounted. These latter records have only been relied upon in those cases where a good figure of the female genital structure was available for comparison; thus, there are a few species (for which no such figures are known to me) the existence of which, in Cornwall, is doubtful, e. g., *Polydesmus gallicus* Latzel, and these I have omitted, for the present, from the county list.

## CHILOPODA.

Order LITHOBIOMORPHA Pocock, 1895.

\* 1. *Lithobius lapidicola* Meinert, 1872.

Larwood records one specimen from Camborne area and I have another from an unheated greenhouse at

Feock (12. vii. 44). In my specimen, as in the one recorded by Larwood, the characteristic spine on the anal leg is present on one side only, and I find on examination of Larwood's specimen that this is the left anal leg, as in mine.

2. *Lithobius borealis* Meinert, 1868.

Larwood's specimen remains the only one of this species so far taken in the county. I have re-examined his specimen and can verify his description and identification.

3. *Lithobius pilicornis* Newport, 1844.

3a. *Lithobius pilicornis* Newport, var. *doriæ* (Pocock, 1890).

Larwood was the first to record the so-called (by Brolemann) "subspecies" *doriæ* (Pocock) from this country, on the strength of two specimens taken in fairly widely-separated houses. Both the specimens were females. I have now several specimens, both of the type-form and of the variety—in one case taken together in the same habitat—and in view of such records it would seem that *doriæ* can no longer be treated as a subspecies and should be relegated to a variety. I have the type-form from a garden at Reskadinnick, near Camborne (10. vi. 43), from garden at Feock (10. viii. 43), and the type and variety from Penlu, Tuckingmill, in a manure-heap (19. ix. 43). From the last of these habitats several specimens were taken, and I summarize very briefly the characteristics of them:—

*Specimen A.*—Antennæ of 32 segments. Punctuations on head fairly marked. Teeth on coxopodite of maxillipedes 4 plus 4 and 1 very small extra tooth on one side (*cf.* one of the specimens recorded by Larwood, which has the same characteristic although more marked in his specimen than in mine). Tergite 9 straight, tergite 11 feebly prolonged, tergite 13 noticeably prolonged. Length 23 mm.

*Specimen B.*—Antennæ of 33 segments. Punctuations on head feeble. Teeth on coxopodite of maxillipedes 4 plus 4. Tergite 9 straight, tergite 11 a little prolonged, tergite 13 noticeably prolonged. Length 15 mm.

*Specimen C.*—Antennæ 31 segments. Punctuations on head very feeble. Teeth on coxopodites of maxillipedes 4 plus 4. Tergites 9 and 11 straight, tergite 13 only very

feebly prolonged. Length 15 mm. This is the true variety *doriæ*.

*Specimen D.*—Antennæ of 36 segments. Punctuations on head fairly marked. Teeth on the coxopodites of maxillipedes 4 plus 4. Tergite 9 straight, tergite 11 moderately and 13 very prolonged. Length 25 mm.

*Specimen E.*—Antennæ of 37 segments. Punctuations on head very strong. Teeth on coxopodite of maxillipedes 4 plus 4. Tergite 9 straight, tergite 11 very feebly prolonged and tergite 13 very prolonged. Length 16 mm.

*Specimen F.*—Antennæ of 33 segments. Punctuations on head very few but those well marked. Teeth on coxopodite of maxillipedes 4 plus 4. Tergite 9 straight, tergite 11 a little prolonged and tergite 13 much prolonged. Length 20 mm.

Thus the great majority of the Cornish specimens have only 4 plus 4 teeth on the coxopodite of the maxillipedes (the only exceptions being the form recorded by Larwood with a small extra tooth on one side only, and the similar specimen of my own recorded above). Thus they differ from the type, which has normally 5 plus 5. I have little doubt that the specimen C above is the true var. *doriæ*, and that the others represent more or less intermediate stages. A convenient diagnosis of the variety is, therefore, var. *doriæ* (Pocock, 1890) as type, except that the teeth on the coxopodite of the maxillipedes are 4 plus 4. The tergites 9 and 11 not prolonged posteriorly and tergite 13 not or only very feebly prolonged. Antennal segments variable, usually less than 35.

The similarity in the number of teeth on the maxillipedes of all specimens from this area is remarkable, and is undoubtedly the effect of the comparative isolation of the area.

#### 4. *Lithobius forficatus* (Linn. 1758).

This species proves to be common almost everywhere in the county. The localities from which I have more than one specimen are Reskadinnick, near Camborne, common everywhere all the year round; under stones on burnt moorland, Playing Place, near Falmouth (15. v. 44); St. Germans (ix. 43); summit of Carn Brea, 750 feet (2. x. 43); in dead leaves, St. Just-in-Roseland (3. x. 43); on salt marsh, St. Erth (v. 43); in carrion trap, Lelant.

St. Ives (iv. and v. 43). This last record is interesting, as they were found in great numbers throughout April and May of 1943 in a carrion trap used by Miss M. Hocken for the study of carrion feeding Coleoptera, although none were to be found in a control trap a few feet away which often contained many woodlice and various beetles. It seems likely then that the species is sometimes a carrion feeder, a fact not mentioned by Brade-Birks (1929) in his paper which discusses the food of centipedes. Attention may be drawn here to a small mistake in this same paper of Brade-Birks, in the analytical key to the British *Lithobius* forms, page 192, therein *Lithobius forficatus* is said to have a double claw and *Lithobius piceus britannicus* a single claw (4a and 4b in the table): this should, of course, be reversed.

5. *Lithobius variegatus* Leach, 1813.

Although Larwood does not record this species it proves to be a common form in the county, with a wide distribution. Some individual records are:—Under stone with *L. forficatus*, Reskadinnick (31. viii. 43): in dead leaves, St. Just-in-Roseland (3. x. 43); in orchard, Polbathic, near St. Germans (9. x. 43); under wood, Feock (5. x. 43).

6. *Lithobius melanops* Newport, 1845.

Larwood records one example of this species and I have three more, all quite typical, from a greenhouse, Tuckingmill (17. x. 43).

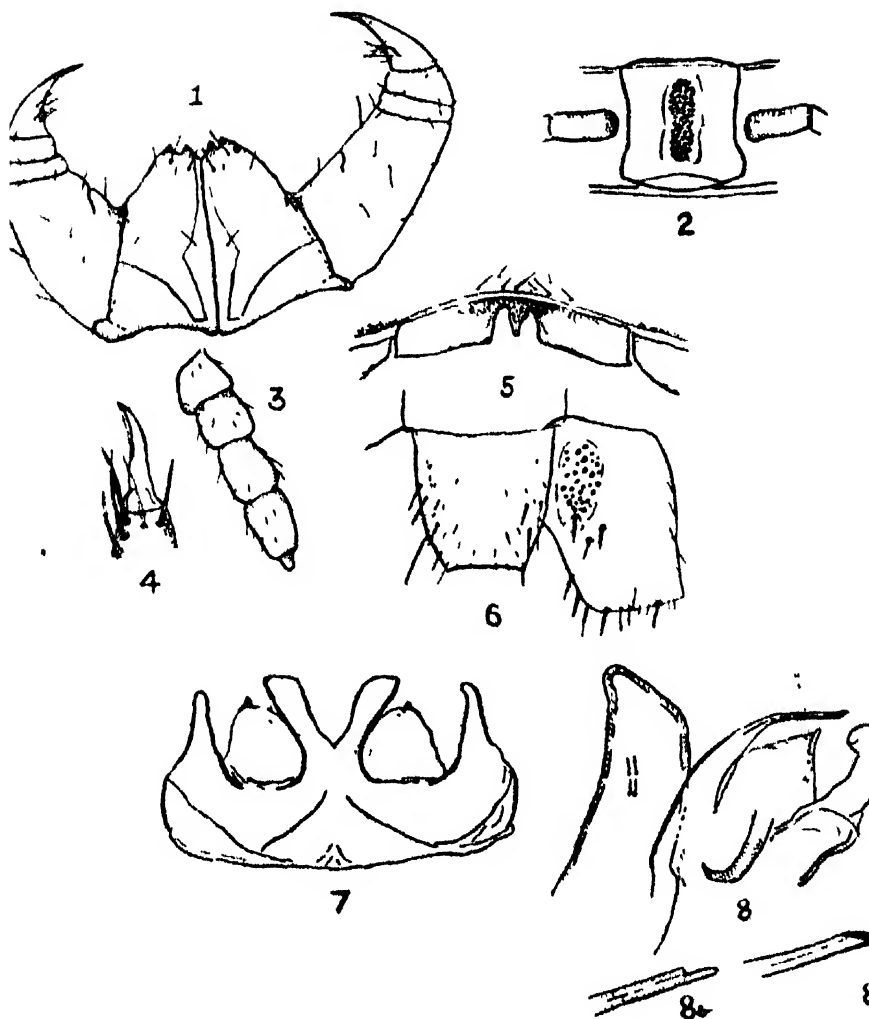
7. *Lithobius dubosqui* Brolemann, 1896.

7a. *Lithobius dubosqui* var. *fosteri* Brade-Birks, 1919.

Several more specimens have come to hand from widely-separated localities, besides the two recorded by Larwood. Among the collection are several examples of the var. *fosteri* Brade-Birks. Records are:—Two specimens from household rubbish, Reskadinnick (6. x. 43): both of these examples are the var. *fosteri*, but both have only the anterior spines on the trochanter and prefemur of the anal legs; several examples from greenhouse, Tuckingmill (13. x. 43): these are all the *dubosqui genuina* of Brolemann, having a double claw to the tarsi of the anal legs: all have 26 segments to the antennæ,



Figs. 1-8.



1. Maxillipedes of *Lithobius duboscqui* (drawn from specimen taken at Tuckingmill). 2. *Chaetachelys montana* var. *oblongocorbellata*: a posterior sternum showing the pore-field. 3. *Schendyla nemorensis* var. *fountaini*: the distal segments of the terminal leg. 4. *Schendyla nemorensis* var. *fountaini*: the apical claw of the second maxilla. 5. Labrum of *Cryptops hortensis* var. *pauiciporus*. 6. Coxa of the terminal legs of *Cryptops hortensis* var. *pauiciporus*, showing pore-field and terminal bristle. 7. Paragonopods of *Polymicrodon polydesmoides* (drawn from specimen taken at St. Just-in-Roseland. 8. Anterior and posterior gonopods (in part) of *Schizophyllum sabulosum* var. *rubripes*, with some of the parts displaced to show the relationships. 8a. Tip of the median branch of the solanomerite (as in fig. 8) more highly magnified; 8b, the same in profile.

but the coxopodite of the maxillipedes is not quite as figured by Brolemann, 1932 (see fig. 1); one specimen of var. *fosteri* (showing a slight remnant of a second tarsal claw on the left anal leg only) from unheated greenhouse, Feock (12. vii. 44).

Sub-Class *EPIMORPHA*.

Order *GEOPHILOMORPHA* Pocock, 1895.

Family *Himanterilidae* Cook, 1895.

8. *Haplophilus subterraneus* (Shaw, 1789).

8a. *Haplophilus subterraneus* var. *complanatus* Cha'lande and Ribaut, 1909.

The type-form of this species is mentioned by Cocks, *l.c.*, and the variety is new to the British list. The type-form was taken under stones in a garden, Feock (xi. 42); also one male and two females from Polbathic, near St. Germans (9. x. 43), and from greenhouse, Tuckingmill (several examples, 17. x. 43). The var. *complanatus* has been taken twice: under stones, Pill Creek Wood, Feock (4. iv. 43), and by pool. Reskadinnick (1. x. 43). Both are completely without the comma-shaped depressions on the sternites and the last example, which measures only 31 mm., has the pore-field entirely absent from the posterior sternites. Brolemann (1932) says this form has hitherto only been found in the Pyrenees.

Family *Schendylidae* Cook, 1895.

9. *Schendyla nemorensis* (C. L. Koch, 1837).

9a. *Schendyla nemorensis* var. *fountaini*, var. nov.

The type-species occurred in profusion in lichen, Polbathic, near St. Germans (18. ix. 43). All the specimens had 39 pairs of legs, in common with all the English examples. Also St. Just-in-Roseland (9. x. 43), one specimen with 40 pairs of legs, *Schendyla nemorensis* var. *fountaini*, var. nov., 41 pairs of legs. Differs from the type in that the last segment of the terminal legs is only one-quarter the length of the penultimate segment, and the penultimate and antepenultimate are broader proportionately than in the type. The apical claw of the second maxillæ is three-and-a-half times as long as broad (instead of two-and-a-quarter). The specimen is 21 mm.

long and has 17 teeth on the labrum. One female in dead leaves, Polbathic, near St. Germans (9. x. 43). (See figs. 3 and 4.)

10. *Brachyschendyla* (*Schizoschendyla*) *monæci*  
(Brolemann, 1904).

This is the first record for the British Isles. Two females from greenhouse, Tuckingmill (10. x. 43). Both measure 14 mm. long and have 53 pediferous segments. They differ from Brolemann's description in that the labial hairs are 2 plus 6 plus 0 (Brolemann gives 2 plus 6 plus 4). Also the telopodite of the "forcipule" has the concavity slightly crenulate. Rather peculiarly, too, there is, on one specimen, a fairly developed claw on one of the terminal legs, and on the other leg it has so atrophied as to be nearly absent. In spite of this, I have no doubt as to the identity of the species, which agrees in every other respect that I can ascertain with Brolemann's (1932) description, and I consider that it would be very premature to set up a new variety for the specimen with claws to the terminal legs.

Family *Geophilidae* (Leach, 1814).

11. *Chætechelyne montana* Meinert, var. *oblongocribellata*  
Verhoeff, 1898.

A single example of this variety, which is recorded here for the first time from the British Isles. It agrees well in all ways with Verhoeff's diagnosis. The specimen is 16 mm. long with 56 pairs of legs; it has three coxal pores and an apical claw to the terminal legs. In a carrion trap in garden, Lelant (8. v. 44). The type-species has been doubtfully recorded from England, and Brolemann (1932) says that it is represented in France only by this variety (which he terms subspecies) in the Alpes Maritimes. He adds that it eventually becomes cavernicolous in the South Tyrol. (See fig. 2.)

12. *Scolioplanes maritimus* (Leach, 1817).

Larwood records this species from the North Cliffs, near Camborne, and it was taken in great abundance by Miss M. Hocken on the salt marsh at St. Erth (29. iv. 44). Possibly it is a fairly local species in the county owing to the great variety of coast-line and the exposed nature of much of it.

13. *Scolioplanes acuminatus* (Leach, 1814).

Cocks has recorded this from Falmouth (1849 and 1851), and I have records from Higher Cardrew, Redruth (iv. 41), and from soil in a garden, Reskadinnick, near Camborne (iii. 42).

As Brade-Birks (1939) has pointed out, part of Brolemann's (1932) description of this species really refers to *Scolioplanes crassipes* (Koch, 1835).

14. *Clinopodes linearis* (C. L. Koch, 1835).

Two specimens taken under stone in an old quarry, Tehidy Woods (16. v. 41). Both of the specimens are quite typical.

15. *Necrophlæophagus longicornis* (Leach, 1814).

Cocks alone has recorded this species from Cornwall; apparently Larwood did not meet with it. I have records as follows:—Under log, Tehidy Woods (26. v. 43); in dead leaves in garden, Higher Cardrew, Redruth (iv. 41); under stones, Polbathic, near St. Germans (3. ix. 43); several under stones on recently burnt moorland, Quench Well, Playing Place, near Falmouth (15. v. 44).

16. *Geophilus carpophagus* Leach, 1817.

Larwood records one specimen of this species from Carn Marth, near Redruth, and having examined his specimen I can verify the determination. Curiously enough, although a fairly common species elsewhere in these Islands, I have never taken an example.

17. *Brachygeophilus truncorum* (Bergsoe and Meinert, 1866).

This, as Larwood says, is a common species everywhere. I have records from Tehidy Woods, Feock, St. Ives and St. Germans.

## Order SCOLOPENDROMORPHA Pocock, 1895.

Family **Cryptopidae** Verhoeff, 1907.18. *Cryptops hortensis* Leach, 1813.18a. *Cryptops hortensis* var. *pauciporus*  
Brolemann, 1908.

Larwood has recorded the type-form from Cornwall, but this is the first record for the British Isles of the

variety. The variety differs from the type in being smaller, paler, and in the fact that the pore-field of the coxopleurite of the 21st leg does not reach beyond the isolated hair at the posterior extremity of the field. My specimens which represent this variety agree exactly with this description (figs. 5 and 6), and they have, moreover, a slightly different form of labrum, which Brolemann does not mention (fig. 5). The variety is found in France, in the Pyrenees. The type-species I have from a greenhouse, Tuckingmill (1. x. 43). The var. *pauciporus* Brol. from greenhouse of gasworks, Tuckingmill (x. 43), and from an unheated greenhouse, Feock (12. vii. 44).

19. *Cryptops parisi* Brolemann, 1920.

This species was first recorded as British in 1935 by Bagnall. Undoubtedly it is an uncommon form in these islands. My single specimen agrees very well with Brolemann's description. The tarsus of the terminal legs has a comb of 4 teeth on the underside, and the specimen is lighter and more slender than *C. hortensis* Leach. Taken in greenhouse, Tuckingmill (10. x. 43).

## DIPLOPODA.

### Sub-Class *PSELAPHOGNATHA* Latzel.

#### Family *Polyxenidae* Gray and Jones, 1842.

##### 1. *Polyxenus lagurus* (Linné, 1758.)

In decaying leaves, Tehidy Woods (29. iv. 40); walking on path, Tehidy Woods (19. vi. 40). Although I have examined the nests of several species of ants in Cornwall, I have never yet found this millipede in any of them; it has occasionally been reported occurring in considerable numbers in such habitats.

### Sub-Class *CHILOGNATHA* Latreille, 1802.

#### Order *ONISCOMORPHA* Pocock, 1887.

#### Family *Glomeridae* Leach, 1814.

##### 2. *Glomeris marginata* (Villers, 1789).

##### 2a. *Glomeris marginata* var. *perplexa* (Latzel, 1895).

Amongst several records of the type-form, which seems widely distributed, I have the following:—In decaying

leaves, Tehidy Woods (29. iv. 40); in dead leaves, St. Just-in-Roseland (3. x. 43); in orchard, Polbathic (18. ix. 43), on cliffs, near Perranporth (v. 41); in a wood near Delabole (5. xii. 41).

For the variety I have records as follows:—Under decaying log, Tehidy Woods (26. viii. 40). in dead leaves, Reskadinnick, near Camborne (several separate records). In addition to the foregoing, the species and the variety with all intermediate forms occur in amazing numbers under stones in Feock gardens. In this locality the species is far more common than I have ever seen it elsewhere, and the variation shown in this most abundant material I hope to deal with in a future paper.

Order PROTEROSPERMOPHORA Verhoeff, 1900.

Family Polydesmidae Leach, 1814.

3. *Brachydesmus superus mosellanus* Verhoeff, 1891.

Taken once from dead leaves at the base of rhododendron bushes in Tehidy Woods (5. vi. 40).

4. *Polydesmus angustus* Latzel, 1884.

This species is common everywhere in the county: with the exception of No. 19, it is certainly the most common Cornish "myriapod." I have never met with any outstanding variation in this species.

5. *Polydesmus testaceus* Koch, 1847.

I have relied on the excellent description and figures of Rolfe (1935) for the identification of this species. Records are as follows:—Many under stones (all females), Reskadinnick (29. viii. 43); in orchard at Polbathic, near St. Germans (3. ix. 43) (one male, one female).

6. *Polydesmus coriaceus* Porath, 1870.

Here again I have relied on the description and figures of Rolfe (1937), and I have no doubt about this species being correctly recorded for Cornwall. Records are:—One female in dead leaves, Reskadinnick (v. 43); under stones, Quench Well, Playing Place, near Falmouth (15. v. 44).

[I have a great deal of material of various Polydesmid females and immature forms which do not, certainly,

seem to belong to any of the above species, but I am unable to identify them at present, although I suspect the presence of *Polydesmus gallicus* Latzel.]

Order ASCOSPERMOPHORA Verhoeff, 1900.

Family **Brachychæteumidæ** Verhoeff, 1911.

7. *Brachychæteuma melanops* Brade-Birks, 1918.

One male from under stone, Polbathic, near St. Germans (3. xi. 43). The external horn of the anterior piece of the syncolpocoxite rather approaches the subspecies *horticola* Brolemann, 1935 (recorded from the Pyrenees<sup>1</sup>), in being slenderer and hardly so long as in the type: it is, moreover, nearly straight and not curved, as in the type, otherwise it is as Brade-Birks' and Brolemann's descriptions. The specimen (in life) was 7.85 mm. long. It has an irregular mass of ocelli and the antennæ just reach to the hind margin of the fourth segment, and are therefore perhaps a little longer than in the type.

Family **Craspedosomidæ** (Jones and Gray, 1842).

8. *Craspedosoma raulinæ* Leach, 1814.

In his 1849 list, Cocks says "Under stones, bark of decayed trees, etc., not uncommon", and in his list of 1853 he says: "Under granite fragments, moss, roots, etc., Budock bottom, College wood:—not uncommon." Both these records refer to Falmouth and, all things considered, there is little doubt that the identification of this distinct form is correct. It must be very local in its occurrence in Cornwall, as I have never met with it, although I have not yet collected it in the Falmouth vicinity.

9. *Polymicrodon polydesmoides* (Leach, 1814).

A male and female under stones, Polbathic, near St. Germans (30. x. 43); one male under dead leaves, St. Just-in-Roseland (3. x. 43). This last male was peculiar in some respects; length 16.5 mm., the distal element of the cheirite of the gonopods is figured by Brolemann as being split at the tip, but in this specimen it was entire and acuminate: also the paragonopods of this specimen are less produced laterally and much more

truncate than those figured by Brolemann. I am hoping to find other specimens in the future which will establish the status of this variation. (See fig. 7.)

Order OPISTHOSPERMOPHORA Verhoeff, 1900.

Family *Blaniulidæ* Attems, 1909.

Subfamily *ISOBATINÆ* Brolemann, 1921.

10. *Isobates varicornis* (Koch, 1847).

Under stones in garden, Feock (4. iv. 42) : in rotten log, Tehidy Woods (26. v. 43) ; in dead leaves, Tehidy Woods (5. vi. 43) ; in dead leaves, St. Just-in-Roseland (3. x. 43).

Subfamily *BLANIULINÆ* Attems, 1909.

11. *Blaniulus guttulatus* (Bosc, 1792).

This species is very common throughout the county, particularly in gardens. I have records for St. Germans, Feock, St. Just-in-Roseland, Truro, Redruth, Camborne and St. Erth. This is the species recorded by Cocks as *Iulus pulchellus* Leach.

In both his 1849 and 1841 papers Cocks mentions two species which are evidently, from where he places them in his list, Balnuilids. These are *Iulus candidus* Müller and *Iulus tuberculatus* Müller. Of the first, in the list of 1851, he adds the note : "The body a pure white spotted with bright scarlet or yellow." Although I have not been able to trace the original description of Müller's there is no doubt that this is simply a clean and adult specimen of *B. guttulatus*, since the only species with which it might be confused is *Archiboreoiulus pallidus* (Brade-Birks), but this has the coloured spots as a rule much lighter, and Cocks especially calls attention to them being "bright." Thus *Iulus candidus* Müller is a synonym of *Blaniulus guttulatus* Bosc., and one that seems to have been overlooked by previous authors. The latter of Cocks' two species I also suspect to be a synonym of the present species. Cocks himself seems to have been uncertain of the identification, for in the 1849 list he says : "Under stones, etc., not uncommon," but in his later list : "Bog-earth, roots of plants in loose and wet soil, etc. :—*source*."



12. *Proteroiulus fuscus* (Am Stein, 1857).

I have several records of this species, but I have never found a male. H. K. and S. G. Brade-Birks (1918) say: "Males of this species are rare; the present record is, however, admissible, as the eyes prove a useful diagnostic character. The ocelli are arranged much the greater number in a long single row, the remainder in a small elongated triangle with its base against the central part of the row, the animal is often associated with *Cylindroiulus silvarum*, and its usual habitat is between bark and trunk of rotting logs." I have therefore based my identifications on the same character. All my records are from Tehidy Woods at different dates, and all are from dead leaves or decaying logs.

## Family Iulidæ Leach, 1814.

13. *Iulus (Micropodiulus) scandinavicus* (Latzel, 1884).

Under stones in garden, Polbathic, near St. Germans (30. x. 43). This is my only record of this species and it seems almost certain that it does not penetrate much further westwards into the county.

14. *Leptoiulus (Acrovelatus) belgicus* (Latzel, 1884).

This species is very common in dead leaves in Tehidy Woods, and I have two other records: in garden, Feock (viii. 43); St. Erth (no habitat given) (18. x. 43).

15. *Ophiulus pilosus* (Newport, 1842).

Under leaves in garden, Reskadinnick, near Camborne (ix. 40); in dead leaves, St. Just-in-Roseland (viii. 43); another specimen from the same place (3. x. 43) was 25 mm. long; Polbathic (9. x. 43). This seems to be a locally common form and is perhaps what is referred to by Cocks (1851) as *Julus niger* var., "this variety is very slender in proportion to its length," he says, and adds that it is found in the same localities as *J. niger* Leach.

16. *Brachyiulus (Microbrachyiulus) pusillus* (Leach, 1814).

In dead leaves, St. Just-in-Roseland (3. x. 43), one female, 14 mm. long.

17. *Schizophyllum sabulosum* (Linné, 1758).

17a. *Schizophyllum sabulosum* var. *rubripes* (Koch, 1847).

This is the first record of the variety for the British Isles. The type is a very common form all over Cornwall. Cocks recorded it from Falmouth, and I have records from Delabole, Polbathic, St. Germans, Feock, Truro, Camborne, North Cliffs and Lelant, near St. Ives. I have noted males both of the normal form and of the forma *elongata* of Brolemann (=Schalt-Stadium of Verhoeff). Brolemann has suggested that the forma *elongata*, which has six segments to the first leg and three tarsalia, is the most primitive, but Verhoeff thinks that it is a later appearance in the phylogeny of the Iulidæ.

The single male of this interesting variety was taken in dead leaves, in copulo with female, Tehidy Woods (5. vi. 43). The male was 34 mm. long, 2.1 mm. broad, and with 48 body-segments. The body was very dark—almost black—the legs all markedly and most noticeably blood-red. The two longitudinal yellow stripes very much reduced and remaining only as indistinct blotches on the hind margin of the metazonites. The male gonopods (fig. 8) show some differences to the type-form. On the peltogonopod (anterior gonopod) are four hairs (=rudiments of telopodite), whilst on all the type-form males which I have examined from this county these hairs vary from six to nine. The median branch of the solanomerite is apically lancet-shaped and not simply acute as in the type, and the mesomerite ends distally in a peculiar and characteristic manner. There are many similarities between this form and *Schizophyllum irregularis* (Attems, 1927), although Attems says his form is 4 mm. broad! The colour is the same, the number of body-segments are the same (the type-form of *S. sabulosum* has 47, 48 or 51 segments), and Attems says that *S. irregularis* has 3 plus 3 labral bristles, a character which my form also has. It is just possible that Attems' species is really synonymous with the var. *rubripes* (Koch). *S. irregularis* was found at San Remo. *S. sabulosum* var. *rubripes* has been recorded from Nizza, Riviera, Val di Non Trentino and Belluno, N.E. Italy (Berlese, 1886). This distribution is extremely interesting and should be compared with some of the chilopod forms mentioned previously, e.g., No. 10 and No. 11.

18. *Tachypodiulus niger* (Leach, 1817).

This form seems to be more common in the east of the county than in the west. It occurs in great numbers at Polbathic, St. Germans and Liskeard (ix. 43). Cocks has recorded it from Falmouth and I have other records from Feock (two specimens), Reskadinnick, near Camborne (one specimen—in this district it is definitely rare), and Lelant, St. Ives (two specimens).

19. *Cylindroiulus punctatus* (Leach, 1817)

This is the most common "myriapod" in west Cornwall. Records are too numerous to quote. It is decidedly less common in the St. Germans district and possibly in the whole of east Cornwall.

20. *Cylindroiulus oweni* (Bollman, 1887).

In leaves, Reskadinnick. one female (x. 40). I have relied on the figure of the vulva given by Rolfe (1938), and my specimen agrees well with this in both the shape of the valves, the arrangement of their hairs and with the ampullæ.

21. *Leucoiulus nitidus* (Verhoeff, 1891).

In dead leaves in Tehidy Woods (2. ix. 43).

The interpretation of the above list for the purposes of zoogeographical studies is a matter of some considerable difficulty. Mere mathematical summarising of the results yields nothing; for instance, 65 per cent. of the above forms occur in Ireland, 66.3 per cent. in the Forth area of Scotland and 71 per cent. in Derbyshire. This seems to show little else than that the fauna is a fairly characteristic one. When attention is given to the detailed distribution of the species on this list, and also those on the list for the whole of the British Isles (Brade-Birks, 1939), two things would seem to emerge quite definitely: firstly, the absences or rarity of many species comparatively common elsewhere in these islands, and secondly, that we have to do with a faunal element hitherto unsuspected in the myriapod fauna of the

British Isles, composed of varieties found elsewhere only in the Pyrennes and the mountain littoral of the western Mediterranean.

The absences are to be accounted for by the comparative isolation of the county and the discontinuity of life-zones caused by the rivers running either north to south, or, more rarely, south to north, and never along the long axis of the county; and in a lesser degree, perhaps, by the deforestation of the county since Pleistocene times and the absence of any lime-bearing rock. Thus we may account for the absence of the fairly common species (elsewhere), *Laymcetes fulvicornis* Meinert, 1868, which is said to favour habitats on the banks of streams. By the same means is to be explained the fact that many members of the truly northern group, e.g., *Geophilus electricus*, have been unable to penetrate into the county, or, if they have succeeded in doing so, they seem to have been unable to do more than establish themselves in small and rare colonies, which are decidedly commoner in the east of the county than in the west (cf. No. 18 of the Diplopoda). By far the greatest number of the Cornish species of myriapods, therefore, have certainly been derived from that fauna, which arose and flourished on a now submerged western land mass in Tertiary times. Brolemann (1932, p. 34) says that some 60 per cent. of the Chilopod fauna of France has its origins in the same source, and this percentage is certainly higher amongst the Chilopod species of Cornwall. Thus both the Chilopod and, perhaps to a lesser extent, the Diplopod fauna of the area at present under consideration is a much less mixed one than that found in the rest of England or even in France.

It may be mentioned, in passing, that in these two classes, as in several others, there are curious correspondences and differences with the Irish fauna (see Turk, 1943): thus the var. *fosteri* of *Lithobius duboscqui* seems, until now, only to have been found in Ireland, and yet one or two other species, not obviously derivations of a northern fauna, have so far not been recorded for Cornwall.

The most striking feature of the Cornish myriapod fauna, however, is the close relationship between it and

the fauna of the Pyrennes and Alpes Maritimes of southern France, forms of which are found too in Spain and Italy. That such a relationship existed between Cornwall and the Iberian peninsula as regards the animal kingdom in general has, of course, long been known, but in the present instance what is more noteworthy is that of such forms of myriapod species (Nos. 3a, 8a, 10, 11, 18a and of Diplopods 17a) some, which elsewhere are true subspecies, i. e., have a restricted geographical range, are in this area varieties, occurring along with the type-form of the species (Nos. 3a, 11 and 18a). The remaining three, whilst true varieties, have a restricted range in the countries mentioned above.

These facts, I think, can best be explained on Reinig's (1939) hypothesis: namely, that many species which arose in Tertiary, Cretaceous and possibly in a few instances pre-Cretaceous times escaped the effects of glaciation in certain glacial "refuges"—of which Cornwall was certainly one—and that during their post-glacial spread by migration there was a selective elimination of genes resulting in the formation of geographical and altitude clines. That such clines exist among the myriapods is scarcely to be doubted, indeed, Larwood (1941) seems to suggest such in the case of a Cornish species, *Lithobius borealis* Meinert, when he shows that the form found in Cornwall agrees in the spinulation of the legs with the Spanish forms. On this hypothesis, then, I suggest that these varieties (and elsewhere subspecies) are the more ancient forms which gave rise to the type-forms, in the manner put forward by Reinig, in post-glacial times. That the most ancient forms should still exist in the land nearest to their point of origin and, moreover, land which has probably suffered less climatic change since glacial times, is only what we might most expect. It seems, too, that the var. *fountaini mihi* of *Schendyla nemorensis*, described in the present paper, supports this view in that the larger number of leg-bearing segments is to be accounted the more primitive. That some of these varieties in our area are subspecies in the French fauna is to be explained by the greater isolation of the French fauna, bounded as their habitat is by the Pyrennes.

One great difference there is, however, between the myriapod fauna of Cornwall and that of the Pyrenees, and this is the paucity of species of Blaniulidæ in our area. This family, according to Brolemann (1923), had its origin on the North American land mass (or more probably in the middle mountain chain of the Atlantean Continent ?—see map, page 15, in Forrest, 1935); these migrated westwards (and eastwards ?) in Tertiary times and later as members of a relict fauna they colonised caves, becoming, for the most part, true Troglobies. Speciation was brought about, therefore, largely by this cave-inhabiting habit and, the Pyrenees being rich in these structures and Cornwall possessing none (other than marine ones), this difference is easily accounted for.

#### SUMMARY.

The Chilopods and Diplopods of Cornwall are listed, and the following forms are added to the fauna of the British Isles:—*Lithobius pilicornis* var. *dorise* (Pocock, 1890)—this one previously by Larwood; *Haplophilus subterraneus* var. *complanatus* Chalande and Ribaut, 1909; *Brachyschendyla* (*Schizoschendyla*) *monæci* (Brolemann, 1904); *Chætechelyne montana* var. *oblongocribellata* Verhoeff, 1898; *Cryptops hortensis* var. *pauciporus* Brolemann, 1908; and *Schizophyllum sabulosum* var. *rubripes* (Koch, 1847).

*Lithobius duboscqui* var. *fosteri* Brade-Birks, 1919, is recorded for the first time outside Ireland, and *Schendyla nemorensis* var. *fountaini* Turk is described as new to science. An element composed of Pyrenean and Mediterranean forms is shown to be present in the Cornish fauna, and the significance of this from a zoo-geographical point of view is discussed.

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**XLIX.**—*New Species of South American and West Indian Chrysomelidæ (Halticinae, Col.).* By G. E. BRYANT, F.R.E.S., Imperial Institute of Entomology.

ALL the types of the new species are in the British Museum (Natural History).

*Aphthona bondari*, sp. n.

Fulvous, with the elytra metallic blue-green, and the seven terminal segments of the antennæ fuscous. Head and prothorax impunctate, the elytra punctate-striate.

Length 2–2.5 mm.

♀.—Head fulvous, impunctate, nitid, transversely impressed between the eyes. Antennæ extending almost to the middle of the elytra, the four basal segments fulvous, the remainder fuscous and pubescent, the two

basal segments more dilated, the second somewhat rounded, the third long and slender, as long as the first two together, the fourth slightly shorter than the third, and the remainder each about equal to the fourth. Prothorax fulvous, impunctate, nitid, transverse, the sides margined and slightly rounded, the anterior angles oblique. Scutellum fulvous, triangular, impunctate. Elytra bright metallic blue-green, slightly broader than the base of the prothorax, rounded at the apex, strongly punctate-striate. Legs fulvous, the male with the first segment of the anterior tarsi more dilated, and slightly smaller than the female. Underside fulvous, the ventral segments of the abdomen tinged with fuscous.

BRAZIL: Bahia, 1930 (Dr. G. Bondar, No. 1584). Five specimens.

Allied to *A. verticalis* Baly, from Brazil, as regards colour, but with the head fulvous. More allied to *A. diversa* Baly, from Mexico.

*Chætoenema insularis*, sp. n. (Fig. 1.)

Broadly ovate, black, nitid, antennæ and legs flavous, with the posterior femora piceous, head and prothorax impunctate, the elytra finely punctate-striate.

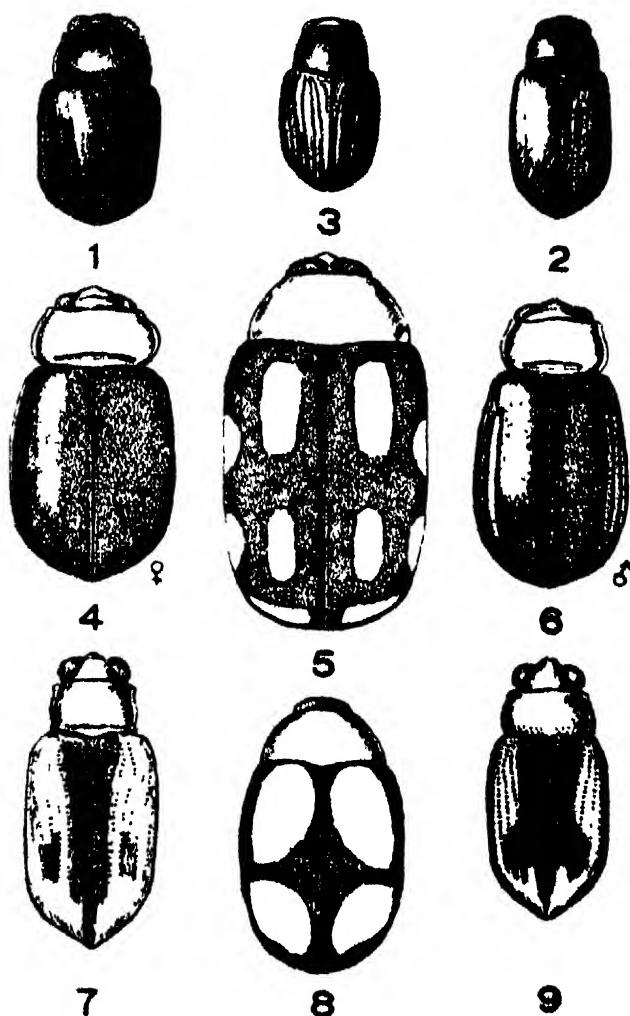
Length 3 mm.

♂♀.—Head black, nitid, the vertex and front smooth, impunctate, a deep groove on either side near the inner margin of the eye. Antennæ short, entirely flavous, extending slightly beyond the base of the elytra, the two basal segments more dilated, the second segment short and ovate, the third to the sixth elongate, slender, and about equal to each other, the seventh to the tenth slightly thickened, the eleventh longer and pointed, with the apex fuscous. Prothorax very transverse, black, nitid, almost impunctate, the sides nearly straight, narrowly margined, and the anterior angles prominent, the basal margin with a few strong punctures. Scutellum black, impunctate, with the apex rounded. Elytra broader than the base of the prothorax, punctate-striate, the punctures not very close together, the intervals smooth. Legs flavous, except the posterior femora, black. Underside black. Male with the first segment of the anterior tarsi more dilated,



BRAZIL: Ilha Santo Amaro, near Santos, 28. iii. 1912  
(G. E. Bryant). Five specimens.

Figs. 1-9.



- |   |  |
|---|--|
| 1. <i>Chastoonema insularis</i> , sp. n.  | 5. <i>Megistops decemmaculata</i> , sp. n. |
| 2. <i>Chastoonema myersi</i> , sp. n.     | 7. <i>Orodes suturalis</i> , sp. n.        |
| 3. <i>Orepidodera insularis</i> , sp. n.  | 8. <i>Megistops trinitatis</i> , sp. n.    |
| 4, 6. <i>Laetia urichi</i> , sp. n. ♀, ♂. | 9. <i>Orodes marginatus</i> , sp. n.       |

Allied to *C. robusta* Baly, from Brazil, but differs in colour, the antennæ shorter, and the punctures on the elytra not so fine.

*Chaetocnema myersi*, sp. n. (Fig. 2.)

Dark ænous, the six basal segments of the antennæ, the tibiæ and tarsi fulvous, all the femora ænous, the prothorax very finely and not closely punctured, elytra deeply punctate-striate.

Length 1.5 mm.

Head dark ænous, nitid, broad, with the eyes almost as broad as the front of the prothorax. Antennæ slender, extending beyond the base of the elytra, the six basal segments fulvous, the remainder fuscous, the two basal segments more dilated, the apical segment long and pointed. Prothorax dark ænous, transverse, the sides feebly margined, the anterior angles oblique, the surface covered with very minute but not close punctures. Elytra convex, rounded at the apex, dark ænous, deeply punctate-striate, the interstices flat and impunctate, except near the lateral margin, which are slightly carinate. Legs with all the tibiæ and tarsi fulvous, the femora ænous, the posterior tibiæ with a strong tooth just below the middle.

S. AMERICA : Venezuela, Mt. Roraima, 1932 (*Dr. J. G. Myers*), three specimens.

May be known from all the described S. American species by its broad head. Somewhat allied to *C. capitata* Jac., from Mexico, but smaller, the elytral striæ much deeper, and the punctures on the prothorax finer.

*Crepidodera insularis*, sp. n. (Fig. 3.)

Brownish black to black, the antennæ and legs fulvous, head and prothorax impunctate, the elytra very finely and closely punctate-striate.

Length 2 mm.

♂♀.—Head black, nitid, impunctate. Antennæ fulvous with the four apical segments tinged with fuscous, extending not quite to the middle of the elytra, the first segment the longest and more dilated, the second short and equal to the third, the five apical segments with their apex slightly thickened. Prothorax black, nitid, not very transverse, the sides slightly rounded and contracted in front, a strong transverse impression before the base, not extending to the sides. Elytra elongate, the sides

parallel and rounded at the apex, brownish black or black, very finely and closely punctate-striate. Legs fulvous, the male with the first segment of the anterior tarsi dilated.

BRITISH W. INDIES Trinidad, Harmony Hall, 26. viii. 1926 (*F. W. Urich*). 2 ♂♂, 3 ♀♀. On sugar-cane.

Allied to *C. rugabunda* Boh., from Peru, but differs in the puncturation of the elytra and colour of antennæ and legs

*Lactica urichi*, sp. n. (Figs. 4, 6.)

Fulvous, with the elytra dark olive-green, the antennæ with the four basal segments fulvous, the remainder fuscous, the head and prothorax impunctate, the elytra finely and irregularly punctate.

Length 3.5-4 mm.

♂. - Head fulvous, impunctate, a triangular impression between the eyes. Antennæ extending not quite to the middle of the elytra, the four basal segments fulvous, the remainder fuscous and more pubescent, the first segment twice as long as the second, the second short and oval, the third slightly longer than the fourth, the remainder each about equal to the fourth. Prothorax fulvous, transverse, the sides rounded and margined, the anterior angles slightly produced, basal groove straight and deeply impressed and limited at the sides. Scutellum fulvous, triangular, impunctate. Elytra dark olive-green, widest behind the middle and rounded at the apex, the sides strongly carinate, very finely and irregularly punctured. Legs fulvous. Underside fulvous. Female differs in being broader, the prothorax more transverse and rounded, and the elytra without the side-margins having carinæ.

BRITISH W. INDIES: Trinidad, 1924 (*F. W. Urich*), 1 ♂♂, 2 ♀♀.

Somewhat allied in structure to *L. frontalis* Jac., from Guatemala, which is entirely dark blue

*Megistops decemmaculata*, sp. n. (Fig. 5.)

Ovate, below fulvous, above the head and prothorax flavous, the elytra fulvous, with ten flavous maculæ, antennæ with the three basal segments flavous, the

remainder fuscous, the prothorax and elytra very finely and closely punctured.

Length 5 mm.

Head flavous, impunctate, the eyes large and contiguous. Antennæ not quite extending to the middle of the elytra, the three basal segments flavous, the remainder fuscous, the first segment as long as the second and third together, the second the shortest, the eight apical segments clothed with fine grey pubescence. Prothorax very transverse, the sides converging from base to apex, the anterior angles rounded, flavous, and very closely and minutely punctured. Scutellum triangular, fulvous, impunctate. Elytra broader than the base of the prothorax, oblong, rounded at the apex, fulvous, each with five flavous maculae, two basal, two behind the middle, and one near the apex, finely and closely rugulose-punctate. Legs flavous, with the posterior femora and apex of tibiae fulvous. Underside fulvous.

PARAGUAY: (*K. Fiebrig*), two specimens.

Allied to *M. fenestra* Illig, from Brazil, as regards size and colour, but the pattern on the elytra quite different, and in having no dark longitudinal line on the prothorax.

*Orodes suturalis*, sp. n. (Fig. 7.)

Testaceous, with the suture and side-margins of the elytra slightly darker, the antennæ black, head and prothorax with a few scattered punctures, the elytra punctate-striate.

Length 4 mm.

Head testaceous, nitid, a few scattered punctures on the vertex, the clypeus flattened and deflexed, the eyes moderately prominent. Antennæ extending beyond the middle of the elytra, black, the first segment as long as the second and third together, the second short and rounded, the fourth longer than the third, the fourth to the apical segment all about equal, and pubescent. Prothorax testaceous, slightly transverse, the sides very slightly rounded and margined, the anterior angles slightly oblique, the posterior angles slightly produced, the basal margin emarginate, a slight transverse impression parallel with the basal margin, with a few scattered punctures. Scutellum testaceous, triangular, impunctate. Elytra

with the basal portion slightly raised, punctate-striate, the apical portion smooth, testaceous, with the suture broadly darker, and the side-margin narrowly darker, and a short dark patch behind the middle between the fourth and sixth striæ. Legs testaceous, the apical portion of the hind femora darker.

S. AMERICA. Venezuela, Mt. Roraima, 1932 (*Dr. J. G. Myers*), three specimens.

Allied to *O. nigropictus* Jac., from Panama, but differs in the pattern of the elytra and its smaller size.

*Megistops trinitatis*, sp. n. (Fig. 8.)

Ovate, convex, head fuscous, antennæ with the three basal segments flavous, the remainder fuscous, prothorax flavous, with the anterior margin slightly fuscous, elytra deep chestnut with four large flavous maculæ.

Length 3.5 mm.

Head fuscous, rounded, eyes large and contiguous. Antennæ extending beyond the base of the elytra, the three basal segments flavous, the remainder fuscous and pubescent, the two basal segments more dilated, the second and third short and about equal, the third more slender than the second, the fourth slender, as long as the second and third together, the fourth to the apical all about equal. Prothorax flavous, very transverse, the sides converging from the base to apex, the anterior angles oblique, the anterior margin narrowly fuscous, very finely and closely punctured. Scutellum fuscous, triangular, nitid. Elytra slightly broader than the thorax, ovate, deep chestnut, with two large flavous maculæ on each, the basal one the largest, oval, slanting obliquely from the suture to the side-margin; the apical one slanting from the side-margin toward the apical sutural angle, very closely and minutely punctured. Legs fulvous, with the posterior femora fuscous, the posterior tibiæ with a long spur dilated and bifid at the apex. Underside fuscous.

BRITISH W. INDIES. Trinidad, 1903 (*G. E. Bryant*), five specimens.

Allied to *M. pretiosus* Baly, from Venezuela, but broader, with the sides more rounded, and the basal maculæ are more oval and less elongate,

*Orodes marginatus*, sp. n. (Fig. 9.)

Below fuscous, head and prothorax fulvous, antennæ with the three basal segments flavous, the remainder fuscous. Elytra flavous, margined with fulvous, and the suture broadly fulvous, expanding behind the middle.

Length 3.5 mm.

Head with the basal half fulvous, the clypeus paler and strongly deflexed, nitid, with a few punctures near the inner margin of the eyes. Antennæ extending beyond the middle of the elytra, the three basal segments flavous, the remainder fuscous, the first segment as long as the second and third together, the fourth a little longer than the third, the fourth to the apical segment all about equal, elongate and slender. Prothorax strongly transverse, fulvous, the sides margined, nearly straight, the anterior angles oblique, a transverse depression parallel to the basal margin, sinuate at the middle and with two transverse rows of punctures. Scutellum fulvous, triangular, nitid. Elytra with the basal portion slightly raised, the sides almost parallel, rounded at the apex, strongly punctate-striate, the punctures almost obliterated near the apex, flavous, the side-margins narrowly fulvous, the suture broadly fulvous, expanding behind the middle and then tapering towards apex. Legs flavous. Under-side flavous.

BRAZIL. Manaus, viii. 1935 (*G. V. Vredenburg*), one specimen.

Allied to *O. suturalis* Bryant, but differs in its smaller size, broader prothorax, in having the elytra margined with fulvous and the colour darker.

The Publishers regret to announce the death of Sir Arthur Smith Woodward, LL.D., F.R.S., F.G.S., for many years one of the leading Conductors of this Magazine. An obituary notice will appear shortly.

# THE ANNALS AND MAGAZINE OF NATURAL HISTORY.

[ELEVENTH SERIES.]

No. 81. SEPTEMBER 1944.

L.—A Key to the Genera of Brachyderinae of the World. By F. I. VAN EMDEN (Imperial Institute of Entomology, London).

(Concluded from p 532.)

## 8. *Strophosomini*.

- |   |       |   |                      |
|---|-------|---|----------------------|
| 1 | (6).  | Shoulders strongly developed.   |                      |
| 2 | (3).  | Eyes very coarsely faceted, not protruding. Antennae slender, scape almost reaching hind margin of eyes. Rostrum separated from frons by a strong transverse impression . . . . .   | <i>Baladzeus</i> .   |
| 3 | (2).  | Eyes finely faceted and strongly protruding. Antennal scape not reaching front margin of eye.   |                      |
| 4 | (5).  | Eyes only strongly convex above level of frons. Antennae extremely short and stout, the second to sixth funicular joints wider than long, the seventh annexed to the club . . . . . | <i>Orophiopeis</i> . |
| 5 | (4).  | Eyes broadly (though quite shortly) stalked. Antennae normal, second funicular joint much longer than wide.   | <i>Podionops</i> .   |
| 6 | (1).  | Shoulders absent or weakly developed.   |                      |
| 7 | (16). | Elytra not keeled, simply rounded to base, shoulder-region therefore convex.  |                      |
| 8 | (25). | Antennal scape not exceeding hind margin of eyes, sometimes reaching it; in this case the constriction of the head very distinct on dorsal surface.                                 |                      |
| 9 | (14). | Antennae very short, reaching about middle of prothorax, scape reaching about middle of eye.  |                      |

- 10 (11). Rostrum separated from frons by a very fine transverse groove. Head indistinctly constricted on dorsal surface ..... *Ædophronus*.
- 11 (10). Rostrum not separated from frons.
- 12 (13). Second ventrite only slightly longer in middle than third, intercoxal process of the first narrower than a hind coxa. Claw-joint much longer than third joint of tarsi ..... *Lagocaulus*.
- 13 (12). Second ventrite as long as the combined median lengths of the third and fourth. Intercoxal process of the first ventrite about as wide as a hind coxa. Claw-joint very short, hardly exceeding the lobes of the third joint ..... *Hypolagocaulus*.
- 14 (9). Antennæ of normal length, about reaching or exceeding hind margin of prothorax, scape reaching about hind margin of eyes ..... *Strophosomus*<sup>43</sup>.
- 15 (8). Antennal scape reaching about front margin of prothorax<sup>44</sup>,<sup>45</sup>. Dorsal surface of head indistinctly constricted. Eyes conically convex<sup>46</sup> ..... *Strophomorphus*.
- 16 (7). Elytra with the base more or less strongly keeled, the outline therefore more or less markedly concave near base.
- 17 (22). Rostrum without a nasal plate that is defined by a keel. Head perfect. Front margin of pronotum not or only slightly produced in middle. Eyes strongly convex.
- 18 (19). Antennal scape not exceeding hind margin of eye ..... *Neliocarus*<sup>47</sup>.
- 19 (18). Antennal scape exceeding hind margin of eye.
- 20 (21). Head not incised on dorsum. Second funicular joint longer than first. Hind tibiae without a mucro, the tarsal groove glabrous ..... *Caulostrophus*<sup>48</sup>.
- 21 (20). Head with a very deep dorsal incision behind the eyes. Second funicular joint shorter than the first. Hind

<sup>43</sup> Including *Foucattia* and *Leucostrophus*. If the latter is considered a subgenus of *Strophosomus*, the former can hardly be treated in a different way. In both aggregates the head constriction is weak on dorsal surface (in *Foucattia*, which has so far been placed in the Brachyderini, even more marked than in *Leucostrophus*), but we developed behind the eyes.

<sup>44</sup> Antennal scape far exceeding front margin of prothorax, very slender. Fore femora distinctly somewhat incrassate : see *Pseudiphi* of Cratopini.

<sup>45</sup> Antennal scape not reaching front margin of prothorax, the passing hind margin of eyes : probably \**Mecheriostrophus*.

<sup>46</sup> Eyes broadly convex, otherwise similar though much slender : *Achradidius*, in which the temples are somewhat narrow posteriorly, but which I have nevertheless included in the Brachyd

<sup>47</sup> Including *Subcaulostrophus* and *Conchoctrophus*.

<sup>48</sup> Including *Caulostrophilus*.



- tibiae with a long strong mucro, tarsal groove squamose ..... *Neocnemis*.
- 22 (17). Rostrum with a nasal plate that is defined by a keel. Head inclined.
- 23 (24). Front margin of pronotum broadly and strongly produced. Eyes weakly convex ..... *Proctes*.
- 24 (23). Front margin of pronotum truncate. Eyes prominent ..... *Proscopus*.

9. *Blosyrini*.

- 1 (10). Nasal plate distinct, defined by a sharp keel or at least a callosity. Rostrum very short, wider than long.
- 2 (3). Base of the elytra sloping to the mesothoracic peduncle in an almost even curve. Frons slightly and evenly convex on either side between the median groove and the eye; rostrum rather plane. Shoulders rounded without a callosity ..... *Proscaphaladeres*.
- 3 (2). Base of the elytra falling off in a more or less sharp and steep declivity. Frons with a shallow impression or a distinct furrow on either side between median groove and eye.
- 4 (5). Fore tibiae lobate exteriorly at apex. Shoulder-curve without a callosity... *Dactylotus*.
- 5 (4). Fore tibiae simply rounded at exterior side of apex, dilated only interiorly.
- 6 (7). Antennal scape exceeding hind margin of eye. Shoulder-curve without a distinct callosity ..... *Blosyropes*.
- 7 (6). Antennal scape not exceeding hind margin of eye.
- 8 (9). Frons only with a shallow impression on either side of median groove. Ventral surface of rostrum concave, the normal impressions more or less obsolete. First ventrite with the hind margin convex ..... *Bradybanon*.
- 9 (8). Frons with a strong furrow on either side of the median groove. Ventral surface of rostrum with two deep longitudinal or oblique impressions, which enclose a convex area. Hind margin of first ventrite straight..... *Blosyrus*.
- 10 (1). Nasal plate not defined; rostrum moderately short, as long as wide or longer. Shoulder-curve with a callosity..... *Holomychus*.

10. *Dermatodini*.

- 1 (2). Rostrum not separated from frons by a furrow or impression<sup>46</sup>; antennal scrobes prolonged on underside of rostrum where they are almost contiguous. Antennae slender, sparsely

<sup>46</sup> With the same characters, but the antennal scrobes not prolonged on the underside of the rostrum: some Cratopini with weakly enlarged front legs.

- haired, shining. Fore and mid-tibiae strongly incurved, all the tibiae strongly dentate interiorly. South America . . . *Atherrhinus*.
- 2 (1). Rostrum separated from frons by a straight or angulate furrow (which is seldom incomplete in middle) or a distinct transverse impression. If the antennal scrobes are prolonged on the underside of the rostrum the tibiae not denticulate. Old World, especially Africa and Madagascar.
- 3 (20). Rostrum dilated to apex where, inclusive of the pterygia, it is wider than the frons.
- 4 (7). Pterygia long and rather strongly projecting at sides, the outer part of the antennal scrobe therefore visible in dorsal aspect in its entire length; rostrum more slender. Eyes moderately large, separated from front margin of prothorax by more than half their largest diameter; antennal scape not reaching their hind margin<sup>50</sup>. Base of rostrum scarcely noticeably wider than frons. Metasternum shorter between the coxae than the mid-coxae. Second visible ventrite at most as long as the third and fourth together but distinctly longer than either, separated from the first by a curved suture.
- 5 (6). Antennal scape passing front margin of eye. Rostrum without a median groove . . . . . *Eustalida*.
- 6 (5). Antennal scape not passing front margin of eye. Rostrum with a median groove . . . . . *Dermatocenus*.
- 7 (4). Pterygia not or hardly projecting, the outer part of the antennal scrobe visible at most anteriorly in dorsal view; rostrum stout.
- 8 (15). Second visible ventrite not much longer than third, suture between the first and second ventrites (almost) straight.
- 9 (12). Eyes large, separated from front margin of prothorax by less than half their largest diameter. Base of rostrum considerably wider than frons. Antennal scape passing front margin of eye but not reaching hind margin.
- 10 (11). Head distinctly constricted on dorsal surface behind eyes. Hind tibiae with a spine at inner side of apex . . . . . *Dermatodes*.

<sup>50</sup> Antennal scape exceeding hind margin of eyes, covering the lower part of the eyes in resting position. Base of rostrum conspicuously wider than frons. Metasternum longer between the coxae than the mid-coxae. *Calamonus* (Otiorrhynchinae).

- 11 (10). Head not constricted on dorsal surface behind eyes. Hind tibiae without a spine at inner side of apex. . . . . *Homoronychus.*
- 12 (9). Eyes not very large though strongly prominent, separated from front margin of prothorax by more than half their greatest diameter. Base of rostrum hardly wider than frons. Antennal scape exceeding hind margin of eye.
- 13 (14). First joint of antennal club much wider even at base than seventh funicular joint, everywhere finely tomentose like the following joints of the club. Corbels not ascending . . . . . *Heterostylus.*
- 14 (13). First joint of antennal club about as wide in basal part as the seventh funicular joint and with scales on that part, which are similar to those of the funiculus, the latter therefore appearing eight-segmented. Corbels ascending . . . . . *Ochtarthrum.*
- 15 (8). Second visible ventrite about as long as the combined length of the third and fourth or longer. Eyes moderately to very slightly convex, separated from front margin of prothorax by at least half their greatest diameter.
- 16 (19). Antennal scrobes prolonged to underside of rostrum.
- 17 (18). Eyes moderately convex. All the tibiae strongly denticulate. Second visible ventrite not quite as long as the third and fourth together. . . . . *Phrystanus.*
- 18 (17). Eyes very slightly convex. Tibiae not denticulate. Second visible ventrite as long on median line as the third and fourth together . . . . . *Mustelinus.*
- 19 (16). Antennal scrobes becoming obsolete at or towards the lower margin of the eyes. Second visible ventrite longer on median line than the third and fourth together . . . . . *Metrioderus.*
- 20 (3). Rostrum not or hardly dilated to apex, at most as wide, inclusive of the pterygia, as the frons. Second visible ventrite conspicuously longer on median line than either the third or the fourth but at the most as long as their combined lengths. Eyes more or less prominent.
- 21 (24). Eyes not stalked, at the most protruding posteriorly owing to a constriction of the head, their dorsal margin, however, evenly passing into frons.
- 22 (23). Hind margin of the first visible ventrite almost straight. Antennal scape not reaching front margin of eye . . . . . *Decophthalmus.*

- 23 (22). Hind margin of the first visible ventrite curved. Antennal scape passing front margin of eye. Tarsal grooves of hind tibiae glabrous ..... *Stigmatrachelus*.
- 24 (21). Eyes shortly stalked, separated from head by a shallow furrow even dorsally; the frons therefore, if seen in lateral view, forming a more or less strong tubercle next to the eyes, which reaches from the neck constriction to the furrow that separates frons and rostrum.
- 25 (26). The furrow between frons and rostrum quadri-sinuate, so that the rostrum overlaps posteriorly in three dorsal and on either side one lateral lobe (in front of each eye). Intercoxal process of abdomen much narrower than a hind coxa ..... *Rhinocerosomphus*.
- 26 (25). The furrow between frons and rostrum simply and slightly arched, rostrum not overlapping frons. Intercoxal process of abdomen broad (if measured found to be four-fifths the width of a hind coxa, but without measuring appearing as wide as or slightly wider than a hind coxa) ..... *Saurophthalmus*.

# 11. (*neorrhini*).

- 1 (33). Head not constricted behind eyes or only very weakly impressed, in the latter case the species concerned does not occur in the Ethiopian region. Two connate claws always present.
- 2 (19). Rostrum not separated from head by a transverse furrow, or such a furrow only indicated but not cutting through the dorso-lateral margin of the rostrum. Apex of fore tibiae never distinctly dilated exteriorly.
- 3 (4). Front femora with a blunt tooth. Nasal plate large ..... *Messorus*.
- 4 (3). Femora unarmed.
- 5 (9). Eyes separated by more than the dorsal width of the rostrum, the latter strongly tapering to apex.
- 6 (7, 8). Antennal scape exceeding middle of eye<sup>51</sup>, the latter strongly convex, especially in posterior half ..... *Pseudopantomerus*.
- 7 (6, 8). Antennal scape reaching about middle of eye, the latter very slightly convex ..... *Leurops*.
- 8 (6, 7). Antennal scape not reaching middle of eye, the latter moderately convex.

<sup>51</sup> Antennal scape exceeding front margin of prothorax. Eyes strongly convex, especially in posterior half: *Dinosius* (Oter-rhynchinae).

- Rostrum much longer than wide, tapering almost like a beak. . . . . *Fleuropis*.
- 9 (5). Eyes separated by at most the dorsal width of the rostrum, or scape not nearly reaching middle of eye and rostrum not strongly narrowed to apex.
- 10 (11). Rostrum as well as its dorsal surface distinctly dilated to apex. Antennal scape reaching about middle of eye . . *Antinia*.
- 11 (10). Rostrum and its dorsal surface narrowed or parallel-sided to apex.
- 12 (13, 14). Antennal scape not reaching middle of eye . . . . . *Formanekia*.
- 13 (12, 14). Antennal scape passing middle but not quite reaching hind margin of eye. Third to seventh funicular joints transverse . . . . . \* *Heydenia*.
- 14 (12, 13). Antennal scape reaching or passing hind margin of eye.
- 15 (18). Antennal scape reaching hind margin of eye.
- 16 (17). Rostrum longer than wide. Shoulder-curve with a tubercle . . . . . *Omotrachelus*.
- 17 (16). Rostrum wider than long. Shoulder-curve without a tubercle. . . . . *Anoris*.
- 18 (15). Antennal scape exceeding hind margin of eye. Rostrum wider than long. Shoulder-curve without tubercles . . . *Heydenonymus*.
- 19 (2). Rostrum separated from head by a strong transverse groove, which distinctly cuts through the dorso-lateral margin; this groove rarely indistinct or only indicated by a slight dilatation of the anterior extremity of the median groove, in these cases the apex of the fore tibiae strongly dilated exteriorly.
- 20 (30). Apex of fore tibiae not or very slightly dilated exteriorly.
- 21 (22, 23). Antennal scape somewhat exceeding hind margin of eye; funicular joints not transverse. Nasal plate defined by a keel. Eyes coarsely faceted, somewhat more strongly convex in posterior half . . . . . *Pseudoprosites*.
- 22 (21, 23). Antennal scape conspicuously exceeding middle of eye; funicular joints 3-6 extremely short, strongly transverse. Head almost vertical in position. All the parts of the body very stout. Elytra subglobular. Femora broadly and strongly emarginate before apex . . . . . *Rhadinoscoptes*.
- 23 (21, 22). Antennal scape not or hardly exceeding middle of eye; funicular joints not or hardly wider than long. Head directed forward.

- 24 (25). Antennal scape reaching about fore margin of eye ..... *Catapionus*.
- 25 (24). Antennal scape reaching about middle of eye.
- 26 (29). Metaepisterna not or hardly narrower behind the moderately dilated front end than behind middle.
- 27 (28). Metaepisterna normal. Antennæ stout ..... *Cnecorrhinus* <sup>32</sup>.
- 28 (27). Metaepisterna extremely narrow, linear. Funiculus of antennæ slender. Body, especially hind end, boat-shaped. .... \**Embolodes*.
- 29 (26). Metaepisterna much narrower behind the front end than behind middle, the front end very strongly dilated. Funiculus of antennæ slender ..... *Tanysonus*.
- 30 (20). Apex of fore tibiæ lobate exteriorly.
- 31 (32). Apex of front tibiæ with a rounded lobe exteriorly and hardly dilated though with a spur interiorly. Pronotum without a median furrow. Transverse groove separating rostrum from head indistinct ..... *Philopedon* <sup>33</sup>.
- 32 (31). Apex of front tibiæ with a sharply toothshaped lobe exteriorly and a smaller but similarly shaped lobe interiorly. Pronotum with a median furrow. Transverse groove separating rostrum from head absent, only indicated by a slight dilatation of the anterior end of the median groove. .... *Analeuropis*.
- 33 (1). Head strongly constricted behind eyes, seldom only slightly impressed or not constricted at all; in the last case only one claw present. Species of the Ethiopian region.
- 34 (39). Temples not or hardly constricted behind eyes, the latter normal, their hind end not protruding.
- 35 (38). Nasal plate indistinct, not defined by a keel.
- 36 (37). Two connate claws. Scutellum distinct <sup>34</sup>. Mentum with setæ ..... *Cychrotomus*.
- 37 (36). Only one claw. Scutellum indistinct. Mentum without setæ ..... *Gyponychus*.
- 38 (35). Nasal plate distinct, defined by a keel. Scutellum absent. Mentum with two setæ. Second ventrite not much longer than the third or fourth, the suture between the first and second straight ..... *Nodiserella*.
- 39 (34). Temples strongly constricted behind eyes, the hind end of the eyes strongly prominent.

<sup>32</sup> Including *Atactogenus* and *Lacordaireus*.

<sup>33</sup> Including *Leptolepyrus*.

<sup>34</sup> Two connate claws. Scutellum indistinct. Head not distinctly constricted behind eyes; *Dinosius* (Otiorrhynchinae).

- 40 (45). Nasal plate indistinct, not defined by a keel. The furrow separating rostrum and frons very clearly visible, especially very conspicuously cutting through dorso-lateral margin.
- 41 (42). Intercoxal process of abdomen strongly angular in front. Front margin of prosternum to the outer side of each coxa with a tubercle. Furrow between rostrum and frons obliquely curved forward toward middle ..... *Enantheus*.
- 42 (41). Intercoxal process of abdomen slightly rounded or truncate and almost straight in front. Front margin of prosternum without a tubercle to the outer side of each coxa.
- 43 (44). Elytra with regular rows of punctures. The furrow between rostrum and head forming a broad arc ..... *Ectatopsides*.
- 44 (43). Elytra with partly confused rows of punctures. The furrow between rostrum and head forming an obtuse angle ..... *Eucrates*.
- 45 (40). Nasal plate distinct though more or less deepened, defined by a strong keel.
- 46 (47). Eyes not very strongly convex. Furrow between frons and rostrum conspicuous. Apex of front tibiae more strongly dilated exteriorly than interiorly, the outer apex in fact forming a process. Tarsi rather narrow, third joint of hind tarsi not much wider than first ..... *Mimulus*.
- 47 (46). Eyes strongly protruding. Apex of front tibiae not dilated exteriorly. Third tarsal joint considerably or much wider than the other joints.
- 48 (51). Second visible ventrite longer than the third or fourth. Furrow between frons and rostrum fine.
- 49 (50). Eyes small, coarsely faceted, protruding as a rounded cone. Furrow between frons and rostrum strongly curved forward in middle. Mentum acetose ..... *Pomphus*.
- 50 (49). Eyes very large, finely faceted, broadly rounded though somewhat overhanging temples. Furrow between frons and rostrum straight or only slightly curved. Mentum with setæ ..... *Protostrophus*.
- 51 (48). Second visible ventrite about as long as each of the two following ones. Furrow between frons and rostrum strong, straight, very conspicuously cutting through dorso-lateral margin of rostrum. Frons with three short and deep longitudinal furrows. Mentum with setæ ..... *Pseudoblosyrus*.

12. *Tanymecini*.a. *Tanymecina*.

- 1 (40). Rostrum without a sharply defined nasal plate or a free labrum, very seldom with an indistinct nasal plate. Front legs never distinctly enlarged.
- 2 (23). Corbels more or less ascending, or if they do not ascend or ascend indistinctly the elytra with distinct shoulders and the scutellum well developed (very small only in *Hodurus*).
- 3 (16). Third joint of hind tarsi much wider than second and distinctly wider than first.
- 4 (15). Metasternum as long as or longer than mid-coxæ (to be measured between the coxæ). Shoulders usually distinct; wings as a rule functional.
- 5 (10). Corbels open or of a peculiar formation, the single row of setules remaining somewhat separated from outer margin behind and suddenly curving down on to it. . . . . *Tanymecus* . . . . 6.
- 6 (9). Prothorax distinctly wider at middle than at base and distinctly wider than the head, including eyes, sides rather strongly rounded.
- 7 (8). Fore coxæ almost as distant from front margin of prosternum as from hind margin. . . . . [s. str.  
Sbg. *Tanymecus*.
- 8 (7). Fore coxæ much closer to front than to hind margin of prosternum. . . . . Sbg. *Megamecus*.
- 9 (6). Prothorax subcylindrical or subconical, not distinctly narrower or even wider at base than in middle where it is as a rule hardly or only slightly wider than the head, including the eyes. . . . Sbg. *Esameus*<sup>55</sup>.
- 10 (5). Corbels enclosed. Base of prothorax more or less bisinuate.
- 11 (12). Corbels narrowly enclosed. Antennal scape rather short. . . . . *Chlorophamus*.
- 12 (11). Corbels broadly enclosed. Antennal scape normal.
- 13 (14). Dorsal margin of antennal scrobe widely separated from lower margin of eye. Rostrum higher than wide, strongly curved. . . . . *Polycamus*.
- 14 (13). Dorsal margin of antennal scrobe directed towards ventral apex of eye. Rostrum not higher than wide, straight. . . . . *Pachneus*.
- 15 (4). Metasternum much shorter between the coxæ than the middle coxæ. Shoulders broadly rounded; wings not functional. Mentum bare. . . . . *Hodurus*.

<sup>55</sup> Including *Pseudasameus*.



- 16 (3). Third joint of hind tarsi not or hardly wider than second and not wider than first.
- 17 (20). Antennal scrobe not very strongly curved downward, the dorsal edge if further extended would reach the lower part or at least the lower margin of the eye (but more strongly bent in *Digl. auridorsis* Reitt.). Tarsi incompletely soled. Elytra with distinctly engraved striae. Third joint of hind tarsi very much shorter than second. Mesosternal process between the mid-coxae much narrower than one of them. Intercoxal process of abdomen rounded or slightly angular, narrower than a hind coxa.
- 18 (19). Shoulders well developed, with a distinct callosity. The outer row of setules in the corbels entirely marginal. . . . . *Phaeophorus.*
- 19 (18). Shoulders broadly rounded. The outer row of setules in the corbels forming in its posterior part an inwardly directed arc, thus avoiding the outer edge behind and reaching it only near middle. Apex of the front tibiae dilated exteriorly and interiorly . . . . . *Diglossotrox.*
- 20 (17). Antennal scrobe strongly curved downward, by further extension the dorsal edge would miss the eye. Elytra without impressed striae<sup>56</sup>, at most with rows of punctures, even near suture or apex. Tarsi soled in the normal way.
- 21 (22). Apex of front tibiae bent inward, broadly rounded exteriorly, not dilated. Elytra with rows of punctures. Third tarsal joint slightly shorter than second . . . . . *Protenomus.*
- 22 (21). Apex of front tibiae somewhat angularly dilated both on inner and outer side. Elytra without rows of punctures. Third tarsal joint much shorter than second . . . . . *Hausserella.*
- 23 (2). Corbels not ascending, the rows of setules only bordering the hind end of the apical truncature of the hind tibiae. Shoulders absent or obtuse; wings not functional. Scutellum very small or absent, seldom distinctly intruding between the bases of the elytra beyond the mesothoracic peduncle.
- 24 (31). Corbels narrowly or broadly enclosed or semienclosed. Third tarsal joint considerably wider than first and second.

<sup>56</sup> Striae engraved. Third joint of hind tarsi distinctly slightly wider than first: see *Hodurus*, paragraph 15.

- 25 (26). Corbels semienclosed. Rostrum separated from frons by a broad and shallow depression, not by a transverse impression. Eyes lateral ..... *Pseudotanymericus*.
- 26 (25). Corbels narrowly or broadly enclosed.
- 27 (30). Mandibles normal; scar distinct. Apex of front tibiae only dilated inwardly, straight or slightly incurved on outer side. Eyes quite lateral, the anterior half of their inner margin perfectly straight in dorsal view<sup>57</sup>.
- 28 (29). Mesosternal process between the mid-coxae much narrower than a coxa. Intercoxal process of abdomen rounded or subangular, narrower than a hind coxa. Third joint of hind tarsi wider than second ..... *Serpticus*.
- 29 (28). Mesosternal process between the mid-coxae almost as wide as a coxa. Intercoxal process of abdomen truncate and wider than a hind coxa. Third joint of hind tarsi not wider than second .. *Anemeroides*.
- 30 (27). Outer surface of mandible strongly compressed and bladelike towards apex; scar not recognizable. Apex of front tibiae strongly dilated interiorly and exteriorly ..... *Meotiorrhynchus*.
- 31 (24). Corbels open.
- 32 (37). Head normal, considerably narrower including the eyes than prothorax at its widest. Vibrissae always well developed. Third joint of hind tarsi as a rule not or not much wider than first.
- 33 (34). Frons narrower than base of rostrum. Intercoxal process of abdomen much narrower than a hind coxa. Antennal scape almost reaching hind margin of eye ..... *Acrocælopus*.
- 34 (33). Frons wider than base of rostrum. Intercoxal process of abdomen not much narrower or even wider than a hind coxa. Antennal scape not reaching hind margin of eye.
- 35 (36). Eyes lying on upper part of lateral surface of head, nearer to dorsal than to ventral surface. Frons very slightly convex, almost plane between the eyes. *Thylacites*<sup>58</sup>.

<sup>57</sup> Eyes somewhat encroaching upon the more convex dorsal surface of the frons, their inner margin distinctly curved, even in anterior half. when viewed dorsally: some *Barynotus* with distinct vibrissae.

<sup>58</sup> Mr. J. Balfour-Browne draws my attention to the fact that the alteration of *Thylacites* into *Cycloderes* in Col. Cat. pars 131 by Günther and Zumpt was unnecessary as *Thylacites* Germar, 1817, Mag. Ent. ii. p. 341, has priority over *Cycloderes* Sahlberg, 1823 (even though in the 1817 paper the only indication is the mentioning of some known species without a generic description). The genotype of *Thylacites* is in consequence *T. fritillum* Panz. according to Mr. Balfour-Browne.

- 36 (35). Eyes fully lateral, slightly nearer to the ventral than to the dorsal surface of the head. Frons strongly convex between the eyes (especially marked in anterior aspect) ..... *Mythecops*.
- 37 (32). Head very large, as wide or almost as wide, including eyes, as prothorax at its widest point. (If this character is not very marked, the vibrissae vestigial.)
- 38 (39). Third tarsal joint not wider than first and second. Head extremely large. Rostrum much wider than long ..... *Klissa*.
- 39 (38). Third tarsal joint considerably wider than first and second. Head large. Rostrum not wider than long. Vibrissae often vestigial ..... *Minyomerus*.
- 40 (1). Rostrum with a nasal plate, which is always clearly and sharply, though often finely, defined, or with a free elongate-triangular labrum. If the former is not very distinct the fore legs enlarged and the fore femora incrassate. Scales of the dorsal surface mosaic-like, not imbricate<sup>69</sup>.
- 41 (44). Fore legs not enlarged. Nasal plate rather large. Vibrissae well developed<sup>69</sup>. Front coxae contiguous.
- 42 (43). Head without a transverse impression behind eyes; the latter not hidden in dorsal aspect. Elytra with prominent shoulders. Tarsal grooves glabrous. Tarsi with spongy soles; third joint of hind tarsi much wider than second. *Homotetrachelus*.
- 43 (42). Head with a transverse impression behind eyes; the latter partly hidden in dorsal aspect by a projection of the frons. Wings non-functional; elytra without shoulders and without a basal margination. Tarsal grooves squamose. Tarsi setulose beneath; third joint of hind tarsi not wider than second. .... *Someranius*.
- 44 (41). Fore legs enlarged; if not very distinctly enlarged (*Isodacrys*, *Polydacrys*) the front coxae separated. Third joint of hind tarsi much wider than first.
- 45 (54). Elytra rounded to base and sloping to the mesothoracic peduncle in the normal way. Corbels open. Neotropical and to some extent Nearctic regions.

<sup>69</sup> In general appearance, and perhaps even in relationship, this group comes very near to the *Astycus*-group of the *Piazomiina*, but it differs considerably by the two important characters of the corbels and claws. However, in *Hadromerus* and *Phenoderus* the enclosed corbels are only linear.

<sup>70</sup> Nasal plate very small and not very distinct; vibrissae vestigial. See *Minyomerus* (N. America), paragraph 39.

- 46 (47). Shoulders absent or indistinct. Front coxæ separated; front legs only moderately enlarged. Body rather stout and very small ..... *Isodacrys*.
- 47 (46). Shoulders distinct.
- 48 (51). Front coxæ separated; front legs only moderately enlarged. The median combined length of the first two ventrites shorter than the width of the first. Body not very elongate.
- 49 (50). Nasal plate very large, its anterior width occupying the whole breadth of the dorsal surface of rostrum. Vibrissæ vestigial ..... *Polydacrys*.
- 50 (49). Nasal plate absent or normal, not more than half as wide as the dorsal apex of rostrum. Vibrissæ as a rule well developed ..... *Pandeleiteius* <sup>61</sup>.
- 51 (48). Front coxæ usually contiguous; if separated, the median combined length of the first two ventrites greater than the width of the first ventrite.
- 52 (53). The median combined length of the first two ventrites much shorter than the width. Body moderately slender. Head and prothorax normal. Fourth to seventh funicular joints longer than wide, at least in part ..... *Hadromeropsis* <sup>61</sup>.
- 53 (52). The median combined length of the first two ventrites greater than the width. Body unusually slender. Head and prothorax strikingly small. Fourth to seventh funicular joints as long as or shorter than wide ..... *Macropterus*.
- 54 (45). Elytra with the base edge-like and falling vertically to mesothoracic peduncle, all the base, or at least its sides in front of the shoulders, with a marginal callosity. Corbels enclosed but linear, shortly ascending. Ethiopian and Oriental regions.
- 55 (58). Shoulders present ..... *Hadromerus* ... 56.
- 56 (57). Prothorax simple at sides ..... Sbg. *Hadromerus*,  
[s. str.]
- 57 (56). Prothorax with the front margin forming a projecting tooth at sides. Front coxæ contiguous in male, narrowly separated in female ..... [merus].
- 58 (55). Shoulders entirely missing ..... Sbg. \* *Neohadromerus*.

<sup>61</sup> *Pandeleiteius submetallicus* Schaeff. is said by Champion, who founded on it the genus *Pandeleiteinus*, to have contiguous front coxæ. In the present key this character would lead to *Hadromeropsis* or *Pandeleiteius*, depending whether greater importance is attributed to the contiguous coxæ or to the enlarged legs. Pierce later listed the species as having broadly separated front coxæ, and he sank *Pandeleiteinus*. I have not seen *submetallicus*.

b. Prypnina.

- 1 (4). Dorsal surface of rostrum uneven, with three blunt longitudinal keels. Corbels narrowly to almost inappreciably enclosed.
- 2 (3). Body with sparse hair-scales only. Front tibiae much broader than the others, very strongly compressed. Antennal scape reaching hind margin of eye ..... *Prostomus*.
- 3 (2). Body with distinct small scales. Front tibiae not stronger than the others, not noticeably compressed. Antennal scape passing hind margin of eye .... *Prypnus*.
- 4 (1). Dorsal surface of rostrum even, without longitudinal keels. Corbels open or semienclosed<sup>61</sup>. Shoulders absent or broadly rounded.
- 5 (14). Penultimate joint of tarsi deeply bilobed, considerably wider than the preceding joints.
- 6 (9). Rostrum with three longitudinal furrows, which are distinct though often shallow; in the latter case the outer furrows are situated quite at the sides of the dorsal surface and converge posteriorly.
- 7 (8). Seventh funicular joint free, hardly larger than the preceding ones and not rounded off with the club. Prostomum with a longitudinal groove. Dorsal surface usually with metallic scales ..... *Amomphus*.
- 8 (7). Seventh funicular joint transverse, broad, annexed to the club and rounded off with it. Prothorax almost longer than wide, punctate. Elytra with rows of coarse punctures. Scutellum not entering suture of elytra. Antennae and legs rather stout. Body slender, *Psolidium*-like and similarly sculptured and partly squamose ..... \* *Psolidimomphus*.
- 9 (6). Rostrum at the most with a fine groove or broad depression along median line.
- 10 (13). Declivity of the elytra among the appressed scales with erect or appressed hair-scales, which are hardly longer than those on the disc. Hind tibiae among the appressed scales with erect, rather short hair-scales; on the dorsal surface of the hind tibiae these are not longer than on the other tibiae.

<sup>61</sup> Not known for *Psolidimomphus* and *Pseudotetanophthalmus*. *Antyus curvicaudatus* (Leptopsinae) would be traced to this paragraph if the weakly developed ocular lobes be overlooked. It differs by broadly enclosed corbels.

- 11 (12). Corbels open. Antennal scape almost reaching hind margin of eye. . . . . *Lechrioderus*.
- 12 (11). Corbels semienlosed. Antennal scape not reaching middle of eye. . . . . *Amystax*.
- 13 (10). Declivity of the elytra with very long erect bristles. Hind tibiae with very long rough hair. Corbels open . . . . . *Enaptorrhinus*.
- 14 (5). Penultimate joint of tarsi only emarginate, not bilobed, not wider than the preceding joints . . . . . *Tenophthalmus* . 15.
- 15 (16). First funicular joint subcylindrical, longer than wide. Elytra usually with more or less distinct ribs. . . . . [mus, s. str.  
Sbg. *Tenophthal*.
- 16 (15). First funicular joint strongly dilated to apex, transverse. Elytra without ribs . . . . . [phthalmus.  
Sbg. *Pseudotamo*.

c. *Piazomiina*.

- 1 (12). Dorsal surface of rostrum with a deep median groove and, immediately adjoining, a parallel, callous longitudinal rib; between the latter and the well marked lateral edge with a shallower, somewhat curved, longitudinal furrow. Seldom the longitudinal callosity on either side of the median groove indistinct, but then the tarsal grooves very distinctly squamose, the median line of the pronotum very deeply engraved, and the impression behind the middle of the pronotum very conspicuous. Shoulders always distinct. Front coxae contiguous; front femora not enlarged; front tibiae not distinctly denticulate on inner edge.
- 2 (11). Eyes strongly convex, more or less protruding. Frons much wider between the eyes than the dorsal surface of the rostrum at the insertions of the antennae. Pronotum with a strong transverse impression towards base. Base of elytra not keeled. Tarsal grooves squamose, only in *Dyscheres* bare or with not more than a few scales at proximal end.
- 3 (6). Eyes strongly protruding, their dorso-interior border emarginate, the temples distinctly somewhat constricted.
- 4 (5). Only one claw; third tarsal joint distinctly wider than the preceding ones, deeply bilobed. Corbels enclosed. *Atmetonychus*.
- 5 (4). Two connate claws; third joint of hind tarsi not or hardly wider than the preceding ones, deeply emarginate. Corbels open . . . . . *Anamorus*.
- 6 (3). Eyes moderately protruding, their dorso-interior border not emarginate, temples seldom constricted.

- 7 (10). Corbels open. Prosternal process simple behind the front coxæ.
- 8 (9). Tarsal grooves at most with a few scales at proximal end. Second joint of antennal club as long as first or shorter . . . . . *Dyscheres*.
- 9 (8). Tarsal grooves squamose to a larger extent. Second joint of antennal club longer than first . . . . . *Dereodus*.
- 10 (7). Corbels enclosed. Prosternal process produced behind coxæ into a two-pointed tubercle . . . . . *Hypomeces*.
- 11 (2). Eyes moderately convex, not protruding. Frons as wide between eyes as the dorsal surface of the rostrum at the insertions of the antennæ. Pronotum only with a very shallow impression, which consists in a dilatation of the median line, towards base. Base of elytra keeled. Corbels enclosed; tarsal grooves glabrous . . . *Prospelates*.
- 12 (1). Dorsal surface of rostrum usually with a shallow median groove, which is never bordered by a callous longitudinal rib. Rarely a strip on either side of median groove slightly but distinctly raised; in this case the tarsal grooves glabrous, the median line of the pronotum only weakly developed, and an impression behind middle of pronotum at most indicated. If the corbels are open, the shoulders absent or the front coxæ separated. Inner edge of fore tibiae always more or less distinctly dentate.
- 13 (78). Rostrum not separated from frons by a sharp transverse groove; frons without a strong tubercle above eyes.
- 14 (47). Outer margin of elytra with a conspicuous excision for the reception of the knob of the metaepisterna; if this excision is not so distinct the corbels enclosed and the shoulders well developed.
- 15 (24). Shoulders indistinct or absent. Corbels open.
- 16 (17). Seventh funicular joint of antennæ free, not closely fitted to club. Apex of tibiae without an uncus interiorly. Antennal scrobe bent downward in front of eye. Base of elytra keeled. Third tarsal joint not much wider than the preceding ones . . . . . *Anomæderus*.
- 17 (16). Seventh funicular joint of antennæ closely fitted to club.
- 18 (23). Base of elytra keeled. Legs rather long, the hind femora reaching or exceeding apex of second ventrite.

- 19 (20). Mucro at inner side of apex of tibiae indistinct. Antennal scrobes strongly curved down far in front of eye. Suture between the first two ventrites not much curved ..... \* *Neoherpisticus* <sup>88</sup>.
- 20 (19). Mucro at inner side of apex of tibiae distinct. Dorsal border of antennal scrobe contiguous with lower margin of eye.
- 21 (22). Outer surface of mandible simple. Inner edge of front tibiae finely denticulate. Antennal scape reaching about middle of eye ..... *Herpisticus*.
- 22 (21). Outer surface of mandible with a subconical process. Inner edge of front tibiae with some long spiniform teeth. Antennal scape exceeding hind margin of eye. Antennal scrobes very shallow. Metaepisterna narrowed behind and in front. Front coxae almost completely separated ..... *Ceryrrhinus*.
- 23 (18). Base of elytra not keeled. Legs short, the hind femora not reaching apex of second ventrite; third tarsal joint not much wider than the preceding ones. Mucro at inner side of apex of tibiae distinct. Antennal scrobe curved downward in front of eye.... *Lissomurhinus*.
- 24 (15). Shoulders present.
- 25 (26). Corbels open. Front coxae separated. Body very small ..... *Isodromus*.
- 26 (25). Corbels enclosed.
- 27 (28). Tarsal grooves completely squamose; setulae of corbels not ascending. All the tibiae with a strong mucro interiorly at apex. Base of elytra not keeled. Front legs not enlarged.... *Platyspiotes*.
- 28 (27). Tarsal grooves squamose at most in proximal part; in this case the front legs distinctly enlarged. Setulae of the corbels at least shortly ascending.
- 29 (32). Corbels ascending by at least the width of the tibial apex, which is only slightly dilated. Rostrum without a fine keel along the inner side of the lateral margin ..... *Polyclesis* ..... 30
- 30 (31). Prothorax dilated from middle to base Sbg. *Polyclesis*, s. str.
- 31 (30). Prothorax subcylindrical in basal half or slightly narrowed to base..... Sbg. *Neocimbium*.
- 32 (29). Corbels shortly ascending, usually for a distance much shorter than the width of the tibial apex, which is as a rule strongly dilated, seldom ascending by about that width; in this case the rostrum with a fine longitudinal keel on either side.

<sup>88</sup> Hustache, 1938, Atti Mus. Stor. nat. Trieste, xiv, p. 88.



- 33 (46). Antennal scape not reaching hind margin of eye.
- 34 (45). Tarsal grooves entirely glabrous.
- 35 (44). Front margin of prothorax simple at sides, or at the most produced anteriorly into a small angular projection; middle of base of pronotum without a tubercle ..... *Lepropus* ..... 36.
- 36 (37). Corbels ascending rather a long way, apex of tibiae only very slightly dilated. Base of pronotum bisinuate, very finely margined ..... Sbg. *Brachyaspistes*.
- 37 (36). Corbels ascending for a distance much shorter than the apical width of the tibia. Tibiae strongly dilated at apex.
- 38 (41). Apex of hind tibiae dilated only exteriorly.
- 39 (40). Front femora on ventral surface with a tooth or spine which may be small but is always sharp ..... Sbg. *Ischnotrachelus*.
- 40 (39). Front femora unarmed, at the most strongly emarginate towards apex, so that an obtuse but never acute dilatation is the result ..... Sbg. *Astycomerus*.
- 41 (38). Apex of hind tibiae dilated exteriorly and interiorly.
- 42 (43). Base of elytra not keeled. Eyes bordered dorsally by a furrow. Rostrum with a longitudinal keel on either side ..... Sbg. *Heteroscapus*.
- 43 (42). Base of elytra distinctly keeled. Sbg. *Lepropus*,  
[s. str. <sup>44</sup>.
- 44 (35). Front margin of prothorax produced downward at sides into a lobate prominence and forward into a small angular projection; middle of base of pronotum with a strong tubercle ..... *Catacynthropus*.
- 45 (34). Tarsal grooves squamose in proximal part. Rostrum with a strong keel along the inner side of the lateral margin ..... *Lepidoepyrus*.
- 46 (33). Antennal scape slightly or considerably exceeding hind margin of eye. Basal keel of elytra not very strong. Elytra only slightly emarginate for the reception of the metaepisternal knob. *Leptoscopus*.
- 47 (14). Outer margin of the elytra with a slight emargination or a very minute excision for the reception of the metaepisternal knob, or, if the excision is larger, the corbels enclosed. Shoulders always absent.

<sup>44</sup> Including *Lepidastycus*, *Astycophilus*, *Lepropus* s. str. (= *Astycus*) and *Astycophobus griseus* Desbr. It is not always easy to distinguish *Lepropus* and *Iphisomus* by the development of the shoulders. I consider (*Iphisomus*) *viridans* Fst. and *mysticus* Fst. better placed in *Lepropus*. A closely related form, if not one that is identical with *viridans*, is the type of *Anosius*.

- 48 (67). *Metaepisterna* distinctly defined from metasternum in their entire length.
- 49 (54). Base of the elytra at most with a slight callosity at the inner intervals, not distinctly keeled, especially without any margination in front of the obsolete shoulders.
- 50 (51). Corbels simple, open. Lateral surface of rostrum with a deep impression in front of eye . . . . . *Hyperomias*.
- 51 (50). Corbels dilatate, enclosed, though only with one row of setules, which is, however, rather distant from the outer edge. Lateral surface of rostrum without a deep impression in front of eye . . . . . *Xylinophorus* . . 62.
- 52 (53). Apex of fore tibiae dilated only interiorly. Sbg. *Xylinophorus*,  
[s. str. (incl. *Sub-xylinophorus*).
- 53 (52). Apex of fore tibiae dilated interiorly and to a lesser degree exteriorly . . . . . Sbg. *Eutinopus* (incl. *Meteutinopus*).
- 54 (49). Base of elytra keeled, the keel very strong even in front of the obsolete shoulders.
- 55 (56). Tarsal grooves more or less squamose. Corbels enclosed. Eyes quite lateral, *Tylopholis*.
- 56 (55). Tarsal grooves wholly glabrous.
- 57 (64). Mentum with two setae. Corbels open or enclosed.
- 58 (63). Antennal scape reaching or exceeding middle of eye. Antennal scrobe moderately curved downward.
- 59 (60). Scutellum distinct. Nasal plate quite undefined . . . . . *Indomias* 65.
- 60 (59). Scutellum concealed. Nasal plate well defined.
- 61 (62). Frons flat transversely, on a level with the upper margin of the eyes. A deep sulcus on either side of nasal plate, these uniting behind with the median furrow . . . . . *Burmotragus* 66.
- 62 (61). Frons more or less convex transversely, on a higher level than the upper margin of the eyes. No definite sulci on either side of nasal plate . . . . . [*Parisomias*),  
[*Heteromias* and *Leptomias* (incl
- 63 (58). Antennal scape reaching about anterior margin of eye. Antennal scrobe very strongly curved downward . . . . . *Orthomias*.
- 64 (57). Mentum with 4-6 setae. Corbels distinctly enclosed.
- 65 (66). Nasal plate well defined. Second funicular joint shorter than first. Front femora normal. Mandibular appendage deciduous 65 . . . . . *Sympiezomias*.

<sup>65</sup> Marshall, 1941, Ann. & Mag. nat. Hist. (11) viii, pp. 347-351. The paragraphs 59-62 are a supplement by Sir Guy Marshall to his key published in that paper.

- 66 (65). Nasal plate quite undefined. Second funicular joint as long as first. Front femora inflated. Mandibular appendage hairy and apparently persistent.<sup>65</sup> *Iphisomus*.
- 67 (48). Metaepisterna connate with metasternum from the hind coxae to the fore end or at least to beyond middle. (The hind end of the metaepisterna projects beyond that of the metasternum. No distinct suture extending the inner margin of this projection runs forward; on the other hand the smooth exterior part—usually covered by the elytra—of the metaepisterna is sometimes defined rather sharply, and the resulting furrow runs between the inner and outer margins of the posterior free projection; it must not be confused with the suture defining the metaepisternum from the metasternum.)
- 68 (75). Antennal scape reaching at most middle of eye. Mid-coxae and hind tibiae of male simple. Base of elytra keeled.
- 69 (74). Corbels open.
- 70 (73). Fore coxae contiguous.
- 71 (72). Outer part of metaepisterna separated by a deep furrow. Rostrum without a distinct keel to the inner side of the side margin. *Molybdonus*.
- 72 (71). Outer part of metaepisterna distinguished only by the absence of scales. *Piazomus*.
- 73 (70). Fore coxae broadly separated. Sixth interval of elytra keeled, the part of the elytra outward of it almost vertical. Antennal scape not reaching middle of eye. Frons and rostrum with a dense longitudinally rugose puncturation; rostrum on either side with a deep longitudinal furrow, which runs obliquely backward and inward. *Calomus*.
- 74 (69). Corbels enclosed. Rostrum often with numerous fine and small irregular longitudinal keels but without a single longitudinal keel inward of each lateral margin. The keel of the elytral base joining the suture, which is somewhat dome-shaped at base. *[Taphrorhynchus]*—*Geotrachus* (incl.)
- 75 (68). Antennal scape reaching about hind margin of eye. Mid-coxae of male produced into a tubercle or a laminate process. Hind tibiae of male arcuate or suddenly bent inward near apex.
- 76 (77). Base of elytra narrowly keeled. Corbels open or very narrowly enclosed. *Pachynotus*.
- 77 (76). Base of elytra not keeled. Corbels open. *Achlamomus*.
- 78 (13). Rostrum on either side separated from frons by a sharply engraved transverse

furrow, very short, with a deep elongate median pit; frons with a strong oblong tubercle, covered with some erect scales, above each eye. Front legs not enlarged. Corbels open, their inner surface completely covered with scales. Base of elytra keeled; shoulders absent. Third tarsal joint much wider than the preceding ones, deeply bilobed .....

*Xenorrhinus*.

### 13. *Sitonini*.

- 1 (16). Rostrum without an elevated nasal plate. Claws free.
- 2 (5). Left mandible with the cutting edge strongly toothed. Third tarsal joint not or only slightly wider than first, in the latter case the corbels rather broadly enclosed. Apex of rostrum somewhat produced on dorsal surface.
- 3 (4). Corbels open. Third tarsal joint not wider than first. .... *Platyrhamphus*
- 4 (3). Corbels enclosed. Third tarsal joint slightly wider than first ..... *Schelopius*.
- 5 (2). Left mandible with the cutting edge describing a sigmoid curve, only the apical tooth strong. Third tarsal joint as a rule much wider than the preceding ones, seldom (*Charagmus*) only slightly wider, in this case the corbels open; otherwise those are open or extremely narrowly enclosed.
- 6 (13). Mandibles of normal size, shorter than the smallest diameter of the eyes. Dorsal surface of rostrum evenly narrowed or parallel-sided to apex; lower edge, and as a rule also upper edge, of antennal scrobe evenly curved downward, the distance between eye and scrobe about as wide as the latter and much narrower than the distance from the scrobe to the lateral front margin of the rostrum.
- 7 (12). Narrow scales among the scales of the elytral intervals non-metallic, rather numerous and especially conspicuous near apex, or altogether absent.
- 8 (11). Shoulders distinct. Elytra rather parallel-sided. Metasternum well developed. Alate ..... *Sitona* ..... 1
- 9 (10). Antennal scrobe slightly curved. Mentum incompletely filling the excision. Dorsal surface of rostrum with an exterior longitudinal furrow, which is bordered interiorly by a keel ..... Sbg. *Charagmus*.
- 10 (9). Antennal scrobe strongly curved. Mentum almost completely filling excision. Dorso-lateral part of rostrum simple . Sbg. *Sitona*, s. str.

- 11 (8). Shoulders absent. Elytra strongly rounded at sides. Metasternum very short. Probably wingless ..... *Parasitones*.
- 12 (7). Narrow scales among the metallic-green scales of the elytral intervals sparse and metallic, suberect. Body stout and short but with distinct shoulders. .... *Ecnomognathus*.
- 13 (6). Mandibles enlarged, longer than the smallest diameter of the eyes. Dorsal surface of rostrum somewhat dilated shortly before apex; lower edge of antennal scrobe suddenly curved down almost at an obtuse angle, the distance between eye and scrobe as large or only slightly smaller than that between scrobe and lateral front margin of rostrum (the scrobe, however, intermediate between the two groups in *Eugn. tenuipes*). Shoulders distinct. Alate species.
- 14 (15). Dorsal surface of rostrum with a lateral callosity or marked edge, the sides subparallel in front of eyes and below the edge with a more or less deep linear impression. Temples shorter than the longitudinal diameter of the eyes ..... *Eugnathus*.
- 15 (14). Dorsal surface of rostrum distinctly defined at sides but not with a marked edge, evenly and strongly dilated from eyes to apex and without a deep impression on upper part. Frons much narrower than dorso-apical part of rostrum. Temples about as long as the longitudinal diameter of the eyes. .... *Catichneus*.
- 16 (1). Rostrum with a large, strongly elevated, squamose nasal plate. Corbels broadly enclosed. Claws free<sup>66</sup>. Mandibles enlarged. Shoulders distinct ..... *Cecraetes*.

11. *Ottistirini*.

- 1 (4). Only one claw. Front coxae rather broadly separated.
- 2 (3). Antennal scrobe T-shaped because its dorsal arm extends rostrad and caudad and is linear. Dorso-apical part of rostrum separated by a transverse furrow ..... <sup>67</sup>*Leasis*.

<sup>66</sup> The claws are free in all the described genera of Sitenini, but I have mentioned the free claws both in paragraphs 1 and 16 instead of the tribal key, as far as I remember, because I have seen an undescribed genus with connate claws which otherwise has the characters of *Cecraetes*.

<sup>67</sup> Zimmerman, 1939, Occ. Pap. Bishop Mus. xiv. p. 302; 1943, J. c. xvii. p. 165; redescriptions of some of Lea's genera of *Ottistirini* also in these papers.

- 3 (2). Antennal scrobe not T-shaped, the dorsal arm developed only rostrad, where it forms a broad pit. Dorso-apical part of rostrum not separated by a furrow ..... *Ottinychus*.
- 4 (1). Two connate claws or claw-joint altogether absent. Antennal scrobes distinctly (only in *Syzygops* indistinctly) T-shaped, i. e. the dorsal end shortly prolonged caudad as well as rostrad, both extensions forming an angle with the main part of the scrobe that runs downward. Dorso-apical part of rostrum separated by a furrow or else the antennal scrobe very clearly T-shaped.
- 5 (22). Dorsal arm of antennal scrobe more or less linear and forming an angle with the lateral arm. Scutellum distinct. Elytra wider near base than prothorax, the former always with shoulders.
- 6 (17). Front coxae very distinctly separated.
- 7 (8). Claw-joint absent. At least the front femora with a rather large sharp tooth near base and with or without a couple of smaller ones near middle. Antennal funicle six-segmented. Dorso-apical part of rostrum not separated by a furrow ..... \* *Vicia*.
- 8 (7). Claw-joint present.
- 9 (12). Elytra navicular, widest at shoulders, narrowed and wedge-shaped posteriorly, somewhat compressed laterally. Dorsal surface largely glabrous, black and shining.
- 10 (11). Constriction of the dorsal surface of the rostrum caused by the antennal scrobes about as wide as frons between eyes, the glabrous apical part of the rostrum marked off only by a slight step ..... *Tisortia*.
- 11 (10). Constriction of dorsal surface of rostrum caused by the antennal scrobes much narrower than frons between eyes (as in *Eutinophea* and *Atrotitis*), the glabrous apical part of the rostrum separated by a deep furrow ..... *Tisortella*.
- 12 (9). Elytra more or less ovate, not compressed laterally behind. Glabrous apical part always distinctly separated from the squamose dorsal surface of rostrum.
- 13 (14). Front femora and front tibiae toothed interiorly ..... *Maleuterpes* \*\*.
- 14 (13). Front femora and front tibiae unarmed.

\*\* According to the characters mentioned in the description, *Euphlocis* is hardly distinct from *Maleuterpes*.

- 15 (16). Pronotum only slightly sloping anteriorly in a weakly convex curve . . . . . *Ottistira*.
- 16 (15). Pronotum almost vertically sloping in front, the declivous part level with frons and rostrum . . . . . \**Nemogenocis*.
- 17 (6). Front coxae contiguous\*\* and dorsal surface of rostrum about as wide between the insertions of the antennae as frons between eyes, or the front coxae narrowly separated and the rostrum much narrower between antennal insertions than frons.
- 18 (21). The squamose part of the dorsal surface of rostrum strongly transverse, inverted-cordiform, much narrower at base than frons between eyes. Dorsum always wholly squamose.
- 19 (20). Antennal scape reaching front margin of prothorax. Eyes almost semi-globular . . . . . *Atroritis*.
- 20 (19). Antennal scape not reaching front margin of prothorax . . . . . *Rutinophana*.
- 21 (18). Dorsal surface of rostrum rather trapezoidal, seldom inverted-cordiform, in this case about as wide at base as frons between eyes . . . . . *Itostira*.
- 22 (5). Dorsal arm of antennal scrobe pit-like, scrobe indistinctly T-shaped. Eyes prominent in front, narrowly separated. Prothorax about as long as wide. Scutellum absent. Basal part of elytra not wider than base of prothorax. Confined to the Madagascan subregion . . . . . *Syzygops*.

15. *Pachyrhynchini*.

- 1 (24). Rostrum separated from frons by a sharply engraved furrow, which is as a rule quite straight and at most very slightly angulate in middle, and which almost reaches side margin or even cuts through it.
- 2 (21). Eyes not very convex, not protruding.
- 3 (20). Rostrum plain or more or less evenly convex from base to apex. Antennal scape reaching at least hind margin of eye . . . . . *Metapocyrtus* . . . . 4
- 4 (13). Dorso-lateral margin of rostrum edge-like, sides almost vertically sloping at base.

\*\* Hind femora strongly incrassate and dentate, the others unarmed.  
\* *Platynotacis*.—Tibiae very short; eyes bluntly pointed anteriorly; outline reminiscent of *Platypodids*: \* *Pellocis*.

- 5 (6). Rostrum (without the mandibles) as long as or shorter than wide at its broadest point, square or trapezoidal, longitudinally convex ..... Sbg. *Artapocyrthus*.
- 6 (5). Rostrum distinctly longer than wide at its broadest point.
- 7 (12). Dorsal surface of rostrum with a convexity along the median line that extends over the whole length, moderately densely punctured, without a trace of longitudinal keels. The anterior margination of the pronotum dilatate towards sides.
- 8 (9). Pronotum punctate, with a distinct groove along front margin that extends all round. Prosternum shallowly emarginate in front ..... Sbg. *Sphenomor-* [phoidea.
- 9 (8). Pronotum granulate, the groove along front margin quite obsolete on dorsum.
- 10 (11). Elytra flattened dorsally, their joint apex acutely excised in female. The front margin of the prothorax slightly dilated below, but gradually tapering at the boundary of the prosternum, the latter only indistinctly emarginate. Sbg. *Proapocyrthus*.
- 11 (10). Elytra strongly convex, their joint apex simple in either sex. The front margin of the prothorax slightly dilated below and suddenly discontinued at the boundary of the prosternum, the latter distinctly emarginate ..... Sbg. *Sclerocyrthus*.
- 12 (7). Dorsal surface of rostrum plain along the median line, slightly convex only towards basal groove and apex. Pronotum usually not granulate ..... Sbg. *Orthocyrthus*.
- 13 (4). Dorso-lateral margin of rostrum rounded off.
- 14 (19). Elytra ellipsoidal or oval, as a rule with a basal keel, seldom flattened dorsally, but then always with a basal keel.
- 15 (18). Elytra with more or less seriate punctures, never granulate.
- 16 (17). Head and rostrum shorter. Elytral declivity moderately steep in male, the joint apex not forming a more or less sharply triangular projection in female ..... Sbg. *Metapocyrthus*, [s. str.
- 17 (16). Head and rostrum longer. Elytral declivity usually steeply rounded in male, the apex of the elytra forming a more or less sharply triangular projection in female ..... Sbg. *Dolicho-* [cephalocyrthus.
- 18 (15). Elytra more or less densely granulate.. Sbg. *Trachycyrthus*.
- 19 (14). Elytra flattened dorsally, without a raised basal margin, their greatest width frequently behind middle. Pronotum always granulate ..... Sbg. *Homalocyrthus*.



- 20 (3). Dorso-apical part of rostrum defined by a well-marked callosity, which remains widely separated from the groove between rostrum and frons, between the latter and the callosity a broad triangular impression. Antennal scrobe dilated posteriorly into a broad triangular impression, the upper margin of which is directed towards middle of eye whilst the lower margin runs towards ventral surface of rostrum. Episternal suture of metathorax impressed only anteriorly . . . . . *Sphenomorpha*.
- 21 (2). Eyes strongly convex, somewhat protruding.
- 22 (23). Dorso-apical part of rostrum without a transverse callosity. Elytra subglobular, without a raised basal margin. Antennal scape exceeding hind margin of eye. Prosternum shallowly emarginate . . . . . *Apocyrthus*.
- 23 (22). Dorso-apical part of rostrum with a transverse callosity. Elytra normal. Antennal scape short, not nearly reaching hind margin of eye; the latter dorsally surrounded by a furrow. *Apocyrthidius*.
- 24 (1). Rostrum not separated from frons by a sharply engraved furrow, or at most near median line with a vestige, which is as a rule distinctly angulate and is continued to side margin at most as a shallow impression.
- 25 (38). Rostrum not swollen in apical half, without a large impression confined to the basal half, but usually with a median furrow.
- 26 (37). Eyes moderately convex.
- 27 (36). Dorsal boundary of antennal scrobe not keel-shaped.
- 28 (33). Dorsal surface of rostrum plain, only with a more or less distinct median furrow. Hind femora not or slightly exceeding apex of elytra; inner surface of hind tibiae with a loose row of short and usually blunt teeth.
- 29 (30). First and second ventrites defined from each other by a complete suture though connate. Front and hind margins of pronotum broad and defined by a sharply engraved line. A deep short vestige of the furrow separating rostrum and frons present on median line . . . . . *Eumacrocyrtus*.
- 30 (29). First and second ventrites completely fused in middle. Anterior marginal groove of pronotum obsolete, hind margin extremely narrowly, finely and A-N very distinctly defined . . . . . *Macrocyrtus* ... 31.

- 31 (32). Joint apex of elytra rounded or truncate in either sex ..... *Macrocyrthus*, s. str.
- 32 (31). Joint apex of elytra with an acute excision in female ..... Sbg. *Exmacrocyrthus*.
- 33 (28). Dorsal surface of rostrum with a broad longitudinal impression. Hind femora distinctly exceeding apex of elytra. hind tibiae at most with fine spinules . . . *Nothapocyrthus* . . 34
- 34 (35). Joint apex of the elytra rounded in either sex ..... *Nothapocyrthus*, s. str.
- 35 (34). Joint apex of elytra with an acute excision in female ..... Sbg. *Ernothapocyrthus*
- 36 (27). Dorsal boundary of antennal scrobe keel-shaped. Rostrum moderately convex in longitudinal as well as transverse direction, its height somewhat decreasing towards apex . . . *Pseudapocyrthus*.
- 37 (26). Eyes almost semiglobular. Antennal scape not reaching hind margin of eye. Rostrum only slightly longer than wide ..... *Pantorrhytes*.
- 38 (25). Rostrum swollen in apical half, its dorsum broadly and shallowly impressed in basal half.
- 39 (40). Antennal scape reaching hind margin of eye. Elytra somewhat depressed in either sex, shortly ovate ..... *Euphryrrhynchus*.
- 40 (39). Antennal scape not reaching hind margin of eye. Elytra convex, sub-ovate ..... *Pachyrrhynchus*.

LI.—*New or little-known Tipulidæ (Diptera).—LXXI. Neotropical Species.* By CHARLES P. ALEXANDER, Ph.D., F.R.E.S., Massachusetts State College, Amherst, Massachusetts, U.S.A.

VIRTUALLY all of the novelties discussed herewith were taken by Mr. Davis Laddey in southern Ecuador. A few additional species were included in extensive series of these flies collected in various parts of Ecuador by Professor F. Martin Brown and Mr. William Clarke-Macintyre. I am very greatly indebted to these entomologists for their continued interest in saving crane-flies in this most interesting region of Tropical America. The types are preserved in my personal collection of these flies.

In considering these species from Ecuador, particular attention should be directed to the very valuable paper published by Professor Brown (*Entomological Stations in Ecuador*, Ann. Ent. Soc. America, xxxiv, 1909-851,

1941). One of the stations visited by Mr. Laddey is Zumbie, on the Rio Zamora, in the Province of Santiago-Zamora (southern Oriente). This locality proved to be exceptionally rich in Tipulidæ, as discussed by the writer in another paper (Journ. N.Y. Ent. Soc. li. p. 206, 1943).

*Tipula (Microtipula) percompressa*, sp. n.

General coloration of thorax light grey, conspicuously patterned with dark brown or brownish black; antennæ (male) elongate, the flagellum black throughout; anterior vertex conspicuously patterned with brownish black, the interspaces light grey; legs yellow, the outer tarsal segments blackened; wings brownish yellow, the prearcular costal fields light yellow;  $R_{1+2}$  more or less atrophied; male hypopygium with the posterior border of the ninth tergite produced medially into a conspicuous, compressed-flattened blade; a single dististyle.

*Male*.—Length about 14 mm.; wing 14 mm.; antenna about 7.8 mm.

*Female*.—Length about 14.5-15 mm.; wing 14-15.5 mm.

Frontal prolongation of head above narrowly but abruptly brownish black, heavily pruinose, the sides and ventral portion yellow; nasus distinct; palpi obscure brownish yellow, the first segment and apex of the last one a little darker. Antennæ (male) elongate, exceeding one-half the length of body; scape and pedicel obscure brownish yellow, the former more darkened, especially at base; flagellum black; flagellar segments elongate, feebly incised; longest verticils about one-half the length of the segment. In female, antennæ much shorter, as is usual in the subgenus. Front polished brownish black, the posterior vertex and occiput paling to obscure yellow; no vertical tubercle; anterior vertex about twice the diameter of the scape.

Pronotum brown medially, heavily light grey pruinose on sides. Mesonotal præscutum chiefly covered by three brown or brownish-black stripes, the interspaces light grey pruinose, more heavily so behind; median stripe and anterior end of lateral stripes more expanded and darkened at the margin, restricting the pruinose ground to small spots behind the pseudosutural foveæ and before the suture; scutum light grey, each lobe with two confluent brownish-black areas; scutellum testaceous brown, the

parascutella darker brown; postnotum brown, very heavily light grey pruinose. Pleura heavily grey pruinose, variegated with brown along the deeply impressed sutures; dorsopleural membrane buffy, darker behind. Halteres obscure yellow, knob blackened. Legs with coxæ pale brown, heavily grey pruinose; trochanters yellow; femora, tibiae and basitarsi obscure yellow, the outer tarsal segments passing into brownish black; claws (male) with a single tooth. Wings with a strong brownish-yellow tinge, the prearcular and costal fields conspicuously light yellow; stigma oval, brown; outer radial field a little darker than the remainder of ground; veins pale brown, luteous in the yellowed fields. No stigmal trichia; vein *M* and its branches without trichia. Venation:  $R_{1+2}$  atrophied or represented only by a basal spur. petiole of cell  $M_1$  nearly twice *m*; cell 2nd *A* moderately wide. In the allotype, vein  $R_{1+2}$  of one wing is preserved though pale.

Abdominal tergites obscure brownish yellow, narrowly blackened medially; basal sternites more reddish yellow; in male, a black subterminal ring involving all of segment seven and the extreme base of segment eight; hypopygium chiefly yellow. Ovipositor with cerci relatively long and conspicuous, reddish brown, the tips broadly rounded; ventral margin of cerci with pale setæ almost to tip. Male hypopygium with the posterior border of tergite produced caudad into a long compressed-flattened blackened blade, subtended on either side by a dense group of seven or eight strong black spinous setæ. Proctiger long and pale, more or less scoop-shaped, jutting beyond the other tergal elements. Dististyle apparently single, suboval to subquadrate in general outline, the apex only a trifle narrower than the base, with obtuse blackened lobes. Appendage of ninth sternite not evident in the unique slide-mount of male, possibly broken. Aedeagus elongate, subtended by very narrow, pale apophyses; penis unusually long and slender, coiled in a loose spiral.

*Hab.* Ecuador (Pinchincha, Manabi).

*Holotype*, ♂, Santo Domingo de los Colorados, Pichincha, altitude 550 metres, March 8, 1941 (*Laddey*). *Allotopotype*, ♀, September 7, 1940 (*Laddey*). *Paratopotype*, 1 ♀, January 2, 1941; *paratype*, 1 ♀, Playones, Palmar, Manabi, altitude 150 metres, May 13-17, 1941 (*Laddey*).

The most similar described species is *Tipula* (*Microtipula*) *nigrovariegata* Alexander, likewise from Ecuador.

which differs conspicuously in the coloration of the body, antennæ, legs and wings. In this latter species, vein  $R_{1+2}$  is strongly persistent but without macrotrichia.

*Tipula (Microtipula) mediocompressa*, sp. n.

General coloration grey pruinose, variegated with polished black, including three very broad stripes on præscutum; antennal flagellum black, the segments only moderately incised, wings with a strong brownish tinge, the prearcular field and cells  $C'$  and  $Sc$  more yellowed; vein  $R_{1+2}$  atrophied; abdominal tergites dark brown, the more basal ones patterned sublaterally with yellow; a broad black subterminal ring; male hypopygium with the ninth tergite produced medially into a relatively narrow, compressed black blade, dististyle unusually compact, its blackened rostral region very obtuse; eighth sternite unarmed.

*Male*.—Length about 13 mm., wing 14 mm., antenna about 6.4 mm.

Frontal prolongation of head relatively long, only a little shorter than the remainder of head, narrowly blackened and pruinose above, broadly light yellow on sides and beneath; nasus distinct; palpi brown, the elongate terminal segment extensively paler on proximal half. Antennæ with scape yellow at tip, infuscated basally; pedicel yellow; flagellum black, the segments moderately incised, with verticils that are much shorter than the segments. Head with the anterior vertex and part of the posterior vertex blackened, the posterior portion of head extensively obscure yellow; front and the very narrow orbits narrowly grey; no vertical tubercle.

Pronotum greyish pruinose, more infuscated medially. Mesonotal præscutum with the restricted ground greyish pruinose, the surface with three very extensive polished black stripes, the median one very broad, especially in front; lateral stripes outcurved to the margins, isolating a small pruinose patch behind; scutum similarly grey, the lobes extensively variegated with black; scutellum yellowish testaceous, the parascutella a little darker; mediotergite black, heavily grey pruinose; pleurotergite with the anapleurotergite more blackened, the katapleurotergite pruinose. Pleura extensively patterned with greyish pruinose and restricted blackened areas on the

anepisternum and pteropleurite, dorospleural membrane silvery yellow. Halteres with stem obscure yellow, narrowly clearer yellow at base, the knob infuscated. Legs with the fore coxæ blackened, paler at tips; remaining coxæ with the pale apices broader, especially on hind legs, the surface more or less pruinose; trochanters brownish yellow. femora and tibiæ yellowish brown, the tips exceedingly narrowly blackened, tarsi passing through yellowish brown to black, very long and slender. Wings with a strong brownish tinge, the prearcular field, cells *C* and *Sc*, together with a seam behind *Cu*, more yellowish, especially *Sc*; stigma oval, brown; veins dark brown, the outer medial ones much more delicate than the radial veins. Squama naked; trichia on distal half of  $R_{2+3}$  and basal two-thirds of  $R_3$ , lacking on all outer medial branches. Venation:  $R_{1+2}$  atrophied; *Rs* subequal to the long *m-cu*, the latter connecting with  $M_{3+4}$  shortly before the fork; cell 1st  $M_2$  narrowed outwardly, *m* being about two-thirds the basal section of  $M_{1+2}$ ; cell  $M_1$  approximately twice its petiole; cell 2nd *A* relatively wide.

Abdomen with the tergites extensively infuscated, appearing especially as a central stripe and across the caudal and lateral borders; basal tergites conspicuously yellow sublaterally, forming an almost unbroken stripe; basal sternites almost uniformly yellow; a broad black subterminal ring, involving segments six and seven, tergite eight, and the proximal two-thirds of the eighth sternite, the apex of the latter broadly yellow; hypopygium yellow. Male hypopygium with the tergite transverse, narrowed outwardly, the median area produced caudad into a long, narrow, compressed, blackened blade, much smaller and narrower than in *percompressa*; base of blade more expanded and provided with numerous appressed spinous setæ; lateral tergal shoulders slightly produced, obtuse. Proctiger without spinous points. Basistyle without a blackened lobe on mesal face at base. Dististyle unusually compact, appearing angularly suboval in outline, the very obtuse beak extensively and heavily blackened; anterior portion of outer margin with relatively few but very long setæ. Ædeagus elongate, subtended at base by small oval apophyses, these much broader than in *percompressa*. Eighth sternite with its caudal margin

evenly and gently rounded, with scattered normal setæ only.

*Hab.* Ecuador, Peru.

*Holotype*, ♂, Rio Zamora, Zumbi, Ecuador, altitude 700 metres, November 4, 1941 (*Laddey*). *Paratypes*, 2 ♂♂, Satipo, Junin, Peru, altitude 800–900 metres, May 27 and September 6, 1940 (*Paprzycki*).

The present fly is most nearly related to *Tipula* (*Microtipula*) *percompressa*, sp. n., from which it differs most evidently in the structure of the male hypopygium, as above compared, particularly the ninth tergite, dististyle, and gonapophyses.

*Tipula* (*Microtipula*) *terribilis*, sp. n.

Size medium (wing, male, 14 mm.) ; general coloration of thorax uniformly yellow or fulvous yellow. antennæ relatively long, exceeding one-half the length of body ; flagellum almost uniformly blackened, the basal enlargements conspicuously developed, wings strongly tinged with yellow, the prearcular and costal fields light yellow ; stigma pale brown, abdomen with a broad subterminal blackened ring, male hypopygium with proctiger bearing two slender arms, each of which forks into two long slender spines ; eighth sternite long and sheathing, at its apex produced into two stout horns.

*Male*. – Length about 13 mm, wing 14 mm ; antenna about 8.2 mm.

Frontal prolongation of head polished yellow, shorter than the remainder of head ; nasus apparently lacking ; palpi obscure testaceous yellow. Antennæ (male) elongate, exceeding one-half the length of body ; basal three segments almost uniformly blackened, the conspicuous basal enlargements a little more intense ; segments beyond the enlargements long-cylindrical, with dense erect pale setæ ; longest verticils shorter than the segments. Head obscure yellow ; anterior vertex moderately wide, a little more than three times the diameter of scape.

Thorax almost uniformly yellow or fulvous yellow, without clearly differentiated præscutal stripes or other markings ; præscutum virtually glabrous, postnotum with scattered long yellow setæ. Halteres with stem yellow, knob infuscated. Legs with coxæ and trochanters yellow ; femora yellow, the tips very narrowly but con-

spicuously blackened, the amount subequal on all legs; remainder of legs light brown, the outer tarsal segments more blackened; claws long and slender, toothed. Wings with a strong yellow tinge, the prearcular and costal fields clear light yellow; stigma oval, pale brown; veins light brown, more yellowed in the brightened fields. Squama naked; veins beyond cord with relatively sparse trichia, including a few on outer portion of  $R_{2+3}$ , basal half of  $R_3$ , a rather close series over the outer three-fourths of  $R_{4+5}$ ; no trichia on  $R_s$  or medial branches. Venation:  $R_s$  relatively long, about one-third longer than  $R_{2+3}$ ; tip of  $R_{1+2}$  atrophied;  $R_3$  long, nearly straight; cell  $M_1$  about twice its petiole; cell 1st  $M_2$  narrowed outwardly,  $m$  being about two-thirds the basal section of  $M_{1+2}$ ; cell 2nd  $A$  relatively wide.

Abdomen yellow, subnitidous, the outer segments a trifle more darkened; a blackened subterminal ring, including segment seven, all of six except the base, and the basal portion of the eighth sternite. Male hypopygium with the tergite large, its caudal border trilobed, the median lobe very broad and convexly rounded, glabrous; lateral lobes narrower, separated from the median one by narrow V-shaped notches; each lobe with its mesal portion more produced and truncated at apex, the outer portion more sloping; at the base of the small lateral notches a group of small setae; disk of tergite with a transverse grouping of long black setae, directed caudad. Proctiger very conspicuous, including a shallow, boat-shaped upper plate and two long arms, each of which forks into two long powerful spines that are slightly unequal in length and diameter. Basistyle relatively short, without a blackened plate on mesal face, as common in many species of the subgenus. Dististyle compact, but complex and difficult of description; beak blackened, relatively small and more or less emarginate at tip; dorsal crest moderately high, glabrous; two outer basal lobes, one a glabrous prolongation of the crest, the other of somewhat similar outline, provided with coarse setae; lower margin of style further produced into a flattened obtusely-rounded plate, its margin set with a few elongate setae. Eighth sternite long and sheathing at apex, produced into two stout horns that narrow into subacute blackened points.

*Hab.* Ecuador (Pichincha).



*Holotype*, ♂, Santo Domingo de los Colorados, altitude 500 metres, September 12, 1940 (*Laddey*).

Although generally similar to various other species of the subgenus, including *Tipula* (*Microtipula*) *diacanthos* Alexander and *T. (M.) smilodon* Alexander, the present fly is entirely distinct in the structure of the male hypopygium, very specifically in the somewhat remarkable proctiger.

*Tipula* (*Microtipula*) *heterodactyla*, sp. n.

Size relatively small (wing, male, about 10 mm.): general coloration of thoracic notum medium brown, without distinct pattern; antennæ of male less than one-half the length of wing; flagellum black, the segments nearly cylindrical, with very poorly-developed basal swellings; wings with a strong brownish tinge, cells *C* and *Sc*, together with the stigma, darker brown; cell  $2m'$  *A* narrow; proximal abdominal tergites dark brown with paler basal rings; a broad subterminal black ring; hypopygium yellow, the tergite terminating in three slender lobes that are tipped with a few black setæ; outer dististyle elongate, inner style produced into two slender lobes, the outer one spine-like; gonapophyses closely adnate to the aedeagus.

*Male*.—Length about 9.5–10.5 mm.; wing 9–10.5 mm.; antenna about 4.3–4.4 mm.

Frontal prolongation of head testaceous yellow, relatively short, scarcely exceeding one-half the remainder of head; nasus lacking, the region provided with several long black setæ; palpi with the basal segment dark brown, the remaining segments obscure yellow. Antennæ (male) with scape and pedicel light yellow, flagellum black; segments elongate, so very gently incised as to appear subcylindrical; verticils much shorter than the segments. Head brown, the front and narrow orbits grey; vertical tubercle entirely lacking.

Pronotum brown. Mesonotum almost uniformly medium brown, without distinct pattern; surface opaque; præscutal setæ lacking. Pleura more testaceous yellow. Halteres infuscated. Legs with the coxæ and trochanters yellow; remainder of legs brown, the femoral bases restrictedly paler; outer tarsal segments blackened; claws (male) simple. Wings with a strong brownish tinge,

cells *C* and *Sc* conspicuously more infuscated to produce a narrow costal border; stigma dark brown; prearcular field not darker than the ground; very narrow dark seams on cord, particularly evident on the anterior cord; obliterative areas inconspicuous, veins dark brown. Wing-base long-petiolate; macrotrichia of radial veins beyond cord abundant, including a series on proximal half of  $R_{1+2}$ ; other trichia on  $M_1$ ,  $M_2$ , distal end of  $M_{1+2}$  and *Rs*. Venation: *Rs* gently arcuated, a little longer than  $m-cu$ ;  $R_{1+2}$  entire; cell 1st  $M_2$  elongate,  $m$  subequal to basal section of  $M_{1+2}$ ; cell 2nd *A* narrow.

Proximal abdominal tergites dark brown, the basal rings paler; tergite five more uniformly paler; tergites six to eight and sternites seven and eight chiefly blackened to form a distinct subterminal ring; hypopygium yellow. Male hypopygium with the ninth tergite transverse, its caudal margin produced into three slender lobes, the median one a trifle shorter and stouter, tipped with about eight black spinous setae; lateral lobes gently incurved at tips, each with about four similar setae. Proctiger appearing as an unmodified flattened hood-shaped structure, without spinous points. Basistyle with a modified lobe on mesal face at base, as is frequent in the subgenus; lobe subtriangular in outline, covered with isolated microscopic tubercles. Outer dististyle a long narrow pale setiferous lobe that is only a little shorter than the inner style. Inner dististyle produced into two slender lobes, the outer one a little shorter and more spine-like than the inner, the latter from a more swollen hairy base. Gonapophyses appearing as flattened plates, their mesal edges entirely united with the aedeagus. Eighth sternite not sheathing or projecting, the posterior half yellow.

*Hab.* Ecuador (Santiago-Zamora).

*Holotype*, ♂, Zumbi, Rio Zamora, altitude 700 metres, October 30, 1941 (*Laddey*). *Paratopotype*, 1 ♂; *paratype* 1 ♂, Mayaico, Rio Nangarico, altitude 1,000 metres, December 2, 1941 (*Laddey*).

It should be noted that both Zumbi and Mayaico are Ecuadorean military outposts in Jivaro Indian country. *Tipula* (*Microtipula*) *heterodactyla* is entirely distinct from other regional species. The structure of the ninth tergite is somewhat as in *T. (M.) tenuilobata* Alexander, whereas

the dististyles are more as in *T. (M.) didactyla* Alexander, though differing conspicuously in all details.

*Tipula (Microtipula) falcifer*, sp. n.

General coloration of head and thorax dark brownish grey; antennæ (male) unusually long, approximately three-fourths the length of the wing; flagellum black, the segments without basal enlargements; wings with a strong brownish tinge, particularly in the cells beyond the cord; cells *C'* and *Sc*, with the stigma, still darker brown; *R*<sub>1+2</sub> preserved; abdomen with a subterminal black ring; male hypopygium with the ninth tergite transversely oval, the caudal margin with two slender lobes; inner dististyle bearing a long curved spine at base; eighth sternite moderately projecting, the broad, slightly produced median portion with a marginal fringe of strong blackened setæ.

*Male*. --Length about 12 mm.; wing 12.5 mm.; antenna about 9 mm.

Frontal prolongation of head short, only about one-half as long as the remainder, yellow; nasus short and stout, with long black setæ; palpi with basal two segments black, the outer two pale yellow, the terminal one a little darkened at apex. Antennæ (male) elongate, approximately three-fourths the length of wing; scape and pedicel obscure yellow, flagellum black; flagellar segments elongate-cylindrical, the bases not enlarged; segments with a short dense erect pale pubescence; verticils longer than the pubescence, the longest on dorsal aspect, nearly one-third of segment, unilaterally distributed, verticils of lower face short and spinoid. Head dark brownish grey; the front more yellowish; posterior orbits narrowly grey.

Pronotum brownish yellow. Mesonotum chiefly and almost uniformly dark brownish grey, this including the scutellum; præscutal stripes not differentiated; præscutum glabrous; parascutella a trifle paler; pleurotergite brownish yellow. Pleura, including the dorsopleural membrane, clearer yellow. Halteres brownish black. Legs with the coxæ and trochanters yellow; femora and tibiæ obscure brownish yellow, their tips narrowly more blackened; tarsi passing into black; claws (male) with small tooth. Wings with a strong brownish tinge, particularly in the cells beyond cord, the base of cell *R*<sub>3</sub> slightly

brightened; cells *C'* and *Sc* dark brown, forming a narrow costal border, brightened on both sides of *h*; stigma dark brown; prestigmal area more whitened; a narrow brown cloud over the anterior cord; veins black. Veins beyond cord with numerous macrotrichia, involving veins  $R_{1+2}$  to  $M_2$  inclusive, as well as  $Rs$ ; a few stigmal trichia. Venation:  $R_{1+2}$  entire;  $Rs$  long, more than one-half longer than  $R_{2+3}$  or one-third longer than  $m cu$ ; petiole of cell  $M_1$  and  $m$  subequal; cell 2nd *A* narrow.

Abdomen with tergites chiefly blackened, more intensely so on outer portions, the basal rings of the more proximal segments yellow; basal six sternites yellow; a broad black subterminal ring involving tergites seven and eight, together with sternite eight with the exception of its distal third; hypopygium obscure yellow. Male hypopygium with the tergite transversely oval in outline, its caudal margin nearly truncate, with a slender lobe on either side of a broad median space, the latter involving less than one-third the transverse length of the sclerite; lobes tipped with long setae, with further scattered bristles down the mesal face. Basistyle elongate, with a blackened lobe on mesal face near base, this strongly emarginate on its inner aspect. Outer dististyle a small simple lobe with relatively few setae. Inner dististyle relatively simple, constricted before the outer head, the latter with a subequal beak and lower beak separated from one another by a deep, narrow incision; outer crest of head with several long setae; at base of style with a long curved slender spine, its tip acute, its total length approximately equal to that part of style beyond its insertion. Notch of ninth sternite with a pair of slender hairy lobes from dilated bases. Gonapophyses with margins slightly angulated or crenulated, not evenly rounded as is common in the subgenus. Eighth sternite moderately sheathing, the broad central portion slightly more projecting, its apex truncated and provided with approximately forty strong black spinous setae.

*Hab.* Ecaudor.

*Holotype*, ♂, Rio Zamora, Zumbi, altitude 700 metres, November 4, 1941 (*Laddey*).

From the other regional species of the subgenus having cell 2nd *A* of the wings very narrow, including *Tipula* (*Microtipula*) *ctenopyga* Alexander, *T. (M.) effeta* Alexander,

and others, the present fly differs conspicuously in the unusually long, nearly simple antennæ, and especially in the structure of the male hypopygium, particularly the ninth tergite, inner dististyle, lobes of the ninth sternite, gonapophyses and eighth sternite.

*Limonia (Peripheroptera morgana)*, sp. n.

General coloration reddish, the mesonotum conspicuously variegated with black, including a transverse oval area at near mid-length of præscutum; femora yellow, the tips rather narrowly blackened; wings bright yellow, conspicuously variegated with light brown and whitish subhyaline; prearcular field relatively short in both sexes, less than the length of vein *M*; free tip of *Sc*<sub>2</sub> lying far basad of *R*<sub>2</sub>; cell 1st *M*<sub>2</sub> longer than any of the veins beyond it, *M*<sub>4</sub> very short; abdomen reddish brown, segments four to six, inclusive, with their bases extensively blackened.

*Male*.—Length about 5.6–5.5 mm.; wing 6.8–8.5 mm.

*Female*.—Length about 5 mm.; wing 6 mm.

Rostrum reddish brown; palpi passing into dark brown, Antennæ brownish black; flagellar segments subcylindrical; verticils very long, on outer segments being approximately twice the length of the segments themselves. Head reddish; anterior vertex moderately wide, approximately three times the diameter of scape.

Pronotum reddish, sparsely pruinose, especially laterally. Mesonotum dark reddish, conspicuously patterned with black, this occurring as a transverse-oval area at near mid-length of præscutum, broadly interrupted at the mid-line; no cephalic median blackening on præscutum; posterior sclerites of notum reddish, variegated with black, including conspicuous areas on the cephalic portion of scutal lobes; posterior margin of scutellum broadly blackened; postnotum reddish, the cephalic and median portion more darkened. Pleura uniformly reddish. Halteres with stem yellow, knob black. Legs with coxæ and trochanters reddish; femora light yellow, the tips rather narrowly but conspicuously black, the amount subequal on all legs; tibiæ brownish yellow, the tips weakly infuscated; tarsi short, black. Wings conspicuously variegated with bright yellow, light brown and whitish subhyaline; ground-colour yellow, occupying

much or all of the prearcular field, cell  $Sc$ , and cell  $R_3$ , together with the basal portion of cell  $R_1$ ; subhyaline areas occupying much of centres of cells  $R$ ,  $M$  and 1st  $M_2$ , with a small area in the base of 2nd  $M_2$ , and more rarely also in  $M_3$ ; the brown areas include the stigma; outer end of cell  $C'$ ; a seam along vein  $M$ , darkest near the arculus; most of cell  $R_5$ , and seams along veins  $M_3$ ,  $M_4$  and the anal veins; veins brown, yellow in the flavous portions. Wing-tip very obtuse; prearcular field relatively short, less than vein  $M$ . Venation: free tip of  $Sc_2$  far removed basad from level of vein  $R_2$ , these two elements occupying the two ends of the long stigma;  $Sc_1$  ending about opposite origin of  $Rs$ , both with a yellowish bullate spot; cell 1st  $M_2$  longer than any of the veins beyond it,  $M_4$  very short, less than the sinuous  $m-cu$ ; cell 2nd  $A$  narrow, constricted on its proximal half.

Abdomen chiefly reddish brown, extensively variegated with brownish black to black on bases of segments four to six, inclusive; subterminal segments reddish brown, the styli more infuscated. Female with abdomen more uniformly reddish, the blackened bases of intermediate segments even more restricted; genital shield blackened; ovipositor with cerci unusually small and slender, strongly upcurved.

*Hab.* Ecuador.

*Holotype*, ♂, Rio Zamora, Zumbi, altitude 700 metres, November 5, 1941 (*Laddey*). *Allotopotype*, ♀, with the type. *Paratopotypes*, 10 ♂♂ 1 ♀, October 28–November 5, 1941 (*Laddey*).

*Limonia* (*Peripheroptera*) *morgana* is an exceptionally beautiful species that is very different from all others of the subgenus hitherto described. The unusually variegated wings somewhat suggest those of *L. (P.) nitens* (Schiner) but the coloration and venation are entirely different. The unusually long cell 1st  $M_2$ , with correspondingly shortened vein  $M_4$ , in conjunction with the very receded free tip of  $Sc_2$ , is quite different from all other species with the exception of the otherwise entirely different *L. (P.) atrosignata* Alexander, of northern Panama.

*Limonia* (*Limonia*) *singularis*, sp. n.

General coloration of thorax reddish brown, the præscutum darker brown medially; antennæ black throughout,

the flagellar segments with short apical necks; legs brownish black; wings with a strong brownish tinge; stigma small, subcircular; *Sc* very long; abdominal tergites brownish black, the sternites bicoloured, dark brown with broad yellow incisures; male hypopygium with caudal margin of tergite straight, without lobes; basistyle apparently without a ventromesal lobe; a single complex dististyle, the main body bilobed and provided with long strong setæ, further produced into a more slender finger-like lobe; rostral prolongation strong, narrowed to the obtuse tip, the outer face on basal portion with raised papillose areas to produce a more or less distinct reticulated appearance.

*Male*.—Length about 5 mm.; wing 5.2 mm.

Rostrum and palpi black. Antennæ black throughout; flagellar segments oval, the outer ones becoming slightly more elongate-oval, with short glabrous necks; verticils relatively short, subequal in length to the segments. Head grey, slightly darker medially behind; anterior vertex reduced to a linear strip.

Pronotum dark brown, the pretergites obscure yellow. Mesonotal præscutum reddish, darker brown medially; scutal lobes infuscated, paling to reddish brown on sides, median region obscure brownish yellow, scutellum and mediotergite darker brown. Pleura and pleurotergite uniform reddish brown. Halteres brownish black, the base of stem narrowly yellow. Legs with coxæ and trochanters reddish yellow; remainder of legs brownish black to black. Wings with a strong brownish tinge, the prearcular and costal fields slightly more whitened; stigma subcircular, very small, darker brown; a more or less distinct darkening behind vein ( $Cu_1$ , more evident basally; veins brown. Macrotrichia of veins conspicuous. Venation: *Sc* long,  $Sc_1$  ending immediately before fork of *Rs*,  $Sc_2$  a short distance from its tip; *Rs* nearly three times the basal section of  $R_{4+5}$ , the latter about equal in length to cell 1st  $M_2$ ; *m-cu* a short distance beyond the fork of *M*; cell 1st  $M_2$  shorter than any of the veins beyond it; vein 2nd *A* beyond its origin long and nearly straight.

Abdominal tergites brownish black; sternites more bicoloured, dark brown, the incisures rather broadly yellow; hypopygium yellowish brown. Male hypopygium with the tergite transverse, its caudal margin straight, without

lobes, the cephalic border more gently convex, a row of about eighteen strong setigerous punctures across the caudal third of sclerite. Basistyle without clearly developed ventromesal lobe. A single complex disistyle, this consisting of a long rostral portion and a strongly bilobed body, the latter further produced into a more slender finger-like lobe, all three of these lobes with abundant dense setæ, with additional long strong bristles on the two major lobes: rostral portion widest at base, thence gradually narrowed to the obtuse or slightly recurved tip; outer face of base densely set, with raised papillose areas to produce a more or less distinct reticulated appearance; no evident rostral spines. Gonapophyses appearing as broad flattened blades, each at apex produced mesad into a subacute spinous point.

*Hab.* Ecuador.

*Holotype*, ♂, Rio Zamora, Zumbi, altitude 700 metres. October 30, 1941 (*Laddey*).

*Limonia* (*Limonia*) *singularis* has no close ally in the Neotropical fauna. The structure of the male hypopygium is unique in regard to almost every part.

*Artarba* (*Artarba*) *laddeyana*, sp. n.

General coloration of thorax pale brown or brownish testaceous, the ventral pleurites more yellowish white; antennæ (male) very long, considerably exceeding the wing in length, white, the incisures of the more proximal flagellar segments very restrictedly blackened; flagellar segments with very long, white, erect pubescence, in addition to the abundant verticils; wings with a weak brownish-yellow tinge, stigma lacking; *Sc* very long, *Sc*<sub>1</sub> ending about opposite three-fourths the length of the long *Rs*; cell 1st *M*<sub>2</sub> closed; male hypopygium with the ædeagus conspicuously bifurcate, the arms shorter than the base.

*Male*.—Length about 5 mm.; wing 5.2–5.3 mm.; antenna about 6.2–6.3 mm.

*Female*.—Length about 5 mm.; wing 5 mm.

Rostrum and palpi light brown. Antennæ (male) of unusual length, exceeding either the body or wing in length; segments white, the basal seven or eight flagellar segments with the incisures very restrictedly blackened, this colour involving both the apex and the base of each



segment : succeeding segments passing into pale brown : flagellar segments elongate-cylindrical, with abundant conspicuous verticils that are unilaterally distributed, and even longer erect pale setæ that are very delicate, the longest ones subequal to or exceeding the segments in length, except on the more proximal flagellar segments where they are a little shorter than the segments. In the female, the antennæ are broken beyond the pedicel but are undoubtedly shorter. Head pale greyish testaceous ; anterior vertex of male narrow, about one and one-half times the diameter of scape ; in female, the anterior vertex much wider, exceeding two and one-half times the diameter of scape.

Pronotum and mesonotum very pale brown or brownish testaceous, with a sparse greyish bloom, unpatterned. Dorsal pleurites pale brown, the ventral ones paling to yellowish white. Halteres pale, the knobs weakly darkened. Legs with the coxæ and trochanters whitened : remainder of legs broken. Wings with a very weak brownish-yellow tinge, the prearcular and costal fields clearer yellow : not differentiated ; veins brownish yellow, those in the brightened fields somewhat clearer yellow. Macrotrichia of veins abundant and in unbroken series. Venation : *Sc* long, *Sc*<sub>1</sub> ending about opposite three-fourths the length of the long *Rs*, *Sc*<sub>2</sub> a short distance from its tip, cell 1st *M*<sub>2</sub> closed ; *m-cu* more than one-half its length beyond the fork of *M*.

Abdomen obscure yellowish brown, the lateral borders narrowly dark brown ; basal sternites clearer yellow : in male, the subterminal segments, particularly seven and eight, blackened to form a conspicuous ring : hypopygium yellow ; abdomen with conspicuous erect pale setæ. Male hypopygium with the outer dististyle, with the exception of the spines, only slightly blackened, relatively broad, the outer margin of the apical half with five or six spines additional to the apical point, the more basal spines smaller, the outermost subequal in length to the apical point. Inner disistyle a gently curved yellow blade that is generally parallel-sided, its tip obtuse, the outer margin with a series of conspicuous setæ. Aedeagus conspicuously bifurcate, the arms shorter than the expanded suboval base.

*Hab.* Ecuador.

*Holotype*. ♂, Rio Zamora, Zumbi, altitude 700 metres, October 30, 1941 (*Laddey*). *Allotopotype*, ♀, pinned with type. *Paratopotype*, ♂, November 2, 1941 (*Laddey*).

*Atarba* (*Atarba*) *laddeyana* is named in honor of the collector, Mr. David Laddey, who has added most materially to our knowledge of the Tipulidæ of Ecuador. The species is one of the most distinct so far discovered, differing from all known relatives in the nature of the antennæ, the elongate vein *Sc*, and the structure of the male hypopygium, particularly the bifurcate ædeagus. This latter character is approached by other species, as *A.* (*A.*) *bifurcula* Alexander and *A.* (*A.*) *punctiscuta* Alexander, but these latter differ from the present fly in all other characters. The male antennæ of the present insect are the longest so far discovered in the subgenus within the Neotropical fauna.

*Atarba* (*Atarba*) *microphallus*, sp. n.

General coloration reddish yellow; antennæ relatively long; flagellum black, the proximal segments weakly bicolored, the incisures being narrowly yellow; knobs of halteres brownish black; femora yellow, the tips very narrowly blackened; wings brownish yellow, stigma pale brown; *Rs* unusually short, only a little longer than the basal section of *R*<sub>5</sub>; abdomen in male with a black subterminal ring; male hypopygium with the plate of the ninth sternite quadrate, the outer lateral angles produced into unusually strong spines; outer dististyle slender, the apical point long, the outer margin with six or seven spines, the more distal ones larger; gonapophyses terminating in a compact group of spinous points; ædeagus unusually small and slender, near its apex with several short spinous points.

*Male*.—Length about 4.5 mm.; wing 5 mm.; antenna about 3.6 mm.

*Female*.—Length about 6 mm.; wing 6 mm.; antenna about 3 mm.

Rostrum yellow; palpi darker. Antenna relatively long in both sexes but especially in the male; scape and pedicel obscure yellow; flagellar segments black, the proximal seven or eight with the incisures restrictedly yellow, involving both the extreme tips and bases of the segments; flagellar segments cylindrical; longest verticils

of the proximal and intermediate segments shorter than the segments. Head brownish yellow, very sparsely pruinose, clearer yellow behind.

Pronotum and mesonotum reddish yellow, unpatterned, pleura slightly more pruinose. Halteres with stem yellow, knob brownish black. Legs with the coxæ and trochanters yellow; femora yellow, the tips very narrowly yet evidently blackened, the amount subequal on all legs; remainder of legs yellow, the outer tarsal segments infuscated. Wings brownish yellow, the prearcular and costal fields clearer yellow, stigma oval, pale brown, relatively conspicuous, veins yellow, a trifle darker over the anterior cord, clearer yellow in the brightened portions. Venation: *Sc* short, *Sc*<sub>1</sub> ending about opposite origin of *Rs*, *Sc*<sub>2</sub> a short distance from its tip. *Rs* unusually short, only a little longer than the basal section of *R*<sub>5</sub>; cell 1st *M*<sub>2</sub> irregularly rectangular to pentagonal in outline, *m* about one third the length of the basal section of *M*<sub>3</sub>; *m-cu* more than one-third its length beyond the fork of *M*.

Abdominal tergites chiefly dark brown, basal sternites yellow, a black subterminal ring (male); hypopygium yellow. In female, tergites dark brown, with paler caudal margins, the ground-colour of the sternites paler. Male hypopygium with the plate of ninth sternite about quadrate in outline, the caudal-lateral angles produced almost directly laterad as acute glabrous dusky horns; caudal border of plate very gently emarginate. Basistyle with a group of six or seven unusually powerful setæ on mesal face near base. Outer dististyle slender, blackened, terminating in an unusually long spine, with six or seven further spines along the outer margin, the distal two or three very long and slender, the remainder reduced in size, the most basal ones barely evident. Inner dististyle longer than the outer, dusky in colour, appearing like a slender boomerang. Gonapophyses terminating in a group of 14 or 15 short strong spinous points to produce a mace-like appearance, the spines continued down the outer face of the apophysis, there becoming more reduced and appressed. *Ædeagus* arising from a broad base, beyond which point it is unusually small and slender, the total length approximately that of the basistyle; apex narrowed, back from the tip with several short, strong, spinous points.

*Hab.* Ecuador (Los Rios).

*Holotype*. ♂, Playas de Juan Montalvo, altitude 15 metres, March 5, 1938 (*Macintyre*). *Allotopotypic*. ♀, April 15, 1938.

*Atarba* (*Atarba*) *microphallus* is quite distinct from all other regional species, differing especially in the structure of the male hypopygium, particularly the plate of the ninth sternite, outer dististyle, gonapophyses and aedeagus. The unusually small aedeagus, with spinous points before the narrow apex, is distinctive of the species.

*Shannonomyia vocator*, sp. n.

General coloration light grey, the head, pronotum and præscutum with a median brown line; lateral præscutal stripes distinct; antennæ short, black throughout; halteres pale yellow; legs uniformly black; wings whitish, with an abundant dotted and spotted brown pattern, including a costal series of eight or nine spots; cell 1st  $M_2$  elongate; abdomen black, sparsely pruinose.

*Male*. Length about 7–8 mm.; wing 7.8–9 mm.

*Female*. —Length about 9 mm.; wing 9 mm.

Rostrum light grey; palpi black. Antennæ short, black, scape more or less pruinose. Head light grey, with a narrow blackish median stripe; anterior vertex wide, nearly four times the diameter of scape; head rather strongly narrowed behind.

Pronotum light grey, with a delicate brown median vitta. Mesonotal præscutum grey with three brown stripes on posterior portion of sclerite, the median line fainter in front, in cases reduced to a capillary, dark brown, median line with a faint clouding on either side to represent the usual stripe; posterior sclerites of notum grey, the scutal lobes weakly darkened. Pleura light grey. Halteres pale yellow throughout. Legs with the coxæ light grey; trochanters brownish yellow; remainder of legs black. Wings whitish, with a relatively abundant and conspicuous brown pattern, as follows:—stigma and a confluent band across anterior cord; prearoular field in cells *C* and *Sc*; a series of eight or nine brown spots in the costal and subcostal fields; a more or less continuous brown seam along vein *Cu*, chiefly in cell *M*, becoming more broken and discontinuous near *m-cu*; veins beyond cord with broad brown seams, especially the more distal

sections, these particularly long and conspicuous on veins  $R_4$  and 2nd  $A$ ; posterior border of cell 2nd  $A$  with broken brown clouds; veins light yellow, darker in the clouded portions. Venation:  $R_{2+3+4}$  short, subequal to or shorter than  $R_2$  or the basal section of  $R_5$ ; cell 1st  $M_2$  long and narrow, irregular in shape; upper face of cell (second section of vein  $M_{1+2}$ ) more than twice the length of distal section of this vein;  $m$  shorter than basal section of vein  $M_3$ , the latter more or less angulated and spurred at near mid-length, the spur jutting into cell 1st  $M_2$ ;  $m$  *cu* about one and one-half times its own length beyond fork of  $M$ .

Abdomen black, sparsely pruinose, the hypopygium scarcely brightened. Male hypopygium with the spinous apical points of the outer dististyle unequal, the outer or subapical one being longer and more slender. What appear to be gonapophyses are massive structures provided with abundant and conspicuous spines and spinous points. Base of aedeagus sinuous.

*Hab.* Ecuador.

*Holotype*, ♂, Hacienda Talahua, Bolivar, altitude 3,100 metres, May 7, 1939 (*Brown*). *Allotype*, ♀, La Calere, near San Juan, Chimborazo, altitude 3,400 metres, April 22, 1939 (*Brown*). *Paratopotype*, 1 ♂, with the type, April 28, 1939; *paratypes*, 2 ♂♂, with the allotype.

The most similar described species are *Shannonomyia austrolathraea* Alexander and *S. lathraea* (Alexander), which have the wings only restrictedly patterned and with the hypopygial details distinct, especially the very different bispinous gonapophyses.

*Oxydiscus (Oxydiscus) æquatorialis*, sp. n.

General coloration dark chestnut-brown, the surface subnitidous; pleura darker brown; legs brown, the tarsi paling to yellowish brown; stigmal trichia relatively numerous; vein  $R_{2+3+4}$  relatively long, subequal to cell 1st  $M_2$ ; petiole of cell  $M_1$  approximately twice the cell; cell 1st  $M_2$  only slightly widened distally, the outer end approximately twice as wide as the base.

*Female*.—Length about 5 mm.; wing 4.7 mm.

Rostrum and palpi black. Antennæ black throughout, 16-segmented; basal flagellar segments enlarged, the outer ones becoming elongate; basal segments with verticils.

chiefly unilaterally distributed, on outer segments occurring on both faces and greatly exceeding them in length. Head dark brown throughout; anterior vertex broad.

Pronotum brownish black. Mesonotal præscutum almost uniform dark chestnut-brown, the surface subnitidous; præscutum with long scattered erect setæ. Pleura dark brown. Halteres infuscated, the base of stem restrictedly yellow. Legs with the coxæ dark brown, the posterior pair somewhat more testaceous; trochanters obscure yellow; femora and tibiæ brown, the tarsi paling to yellowish brown. Wings with a weak brownish tinge, the stigmal region very slightly darker, ill-delimited; prearcular and costal fields very slightly more yellowish; veins brown, those in the more brightened costal portions a little paler. Sparse macrotrichia in outer ends of cells  $R_3$  to 2nd  $M_2$ , inclusive, most conspicuous as a series on outer two-fifths of cell  $R_4$ ; stigmal trichia relatively numerous. Venation:  $Sc_1$  ending just before level of fork of  $Rs$ ,  $Sc_2$  some distance from its tip,  $Sc_1$  alone being about two-thirds as long as  $R_{2+3+4}$ ; vein  $R_2$  very faint to nearly atrophied, close to fork of  $R_{2+3+4}$  or approximately its own length beyond this fork, the position variable;  $r-m$  strongly arcuated;  $m-cu$  about its own length beyond the fork of  $M$ ; petiole of cell  $M_1$  approximately twice vein  $M_2$  alone.

Abdomen dark brown, the elongate valves of ovipositor more horn-yellow.

*Hab.* Ecuador.

*Holotype*, ♀, Zamora, Santiago-Zamora, altitude 1,000 metres, October 19, 1941 (*Laddey*).

The present is the first record of occurrence of the genus *Oxydiscus* de Meijere in South America. The most similar regional species is *Oxydiscus* (*Oxydiscus*) *costaricensis* (Alexander) of Costa Rica, which differs in the venation and degree of trichiation on the wing-disk, especially in the stigmal field. In this latter fly,  $R_{2+3+4}$  is distinctly shorter than cell 1st  $M_2$ , which is very strongly widened outwardly so that it is approximately three times as wide across its outer end as it is across the base.

*Teucholabis* (*Paratropesa*) *neocollaris*, sp. n.

Allied to *collaris*; general coloration of mesonotum and abdomen blue-black; all three femora differing in color-

tion from one another ; wings whitish subhyaline, with three brown cross-bands, the first reaching the costal margin at *h* ; male abdomen having the sternal pocket with numerous strong spines ; hypopygium with the spine on mesal face of basistyle slender and acute.

*Male.* - Length about 7 mm. ; wing 6.5 mm.

Rostrum obscure yellow ; palpi dark brown. Antennæ with scape obscure yellow, more darkened above ; pedicel obscure yellow ; flagellum black ; basal flagellar segments oval, the outer ones more elongate ; verticils abundant and relatively conspicuous ; terminal segment subequal in length to the penultimate. Head with front obscure yellow, the vertex extensively blue-black ; posterior genæ restrictedly yellow.

Pronotum yellowish white, the scutellum and pretergites blackened. Mesonotum uniformly blue-black, highly polished. Pleura similarly blue-black ; cephalic portion of pteropleurite with a transverse band of appressed silvery pubescence ; dorsopleural membrane dusky ; meral region pale yellow. Halteres with stem black, knob abruptly pale yellow. Legs with the fore and middle coxæ and trochanters yellow, posterior coxæ and trochanters abruptly black ; fore femora black, with only the extreme base obscure yellow, remainder of fore legs uniformly black ; middle femora obscure yellow, tibiæ dark brown, passing into black ; tarsi black ; posterior femora yellow, with two conspicuous black rings, one nearly basal in position, the other nearly apical, these rings subequal in extent and each about one-half as wide as the yellow intervening space ; tibiæ dark brown, the tips and the tarsi black ; posterior basitarsi swollen on proximal half and here provided with a dense linear series of short black setæ. Wings whitish subhyaline, with three brown cross-bands ; basal band beginning at costa at and beyond *h*, occupying the bases of cells *R*, *M* and *Cu* and crossing cell 1st *A* ; second band completely crossing the wing at the cord, darker in the stigmal field ; outer band occupying the broad wing-tip, its inner edge at the fork of *R*<sub>3+4</sub> and just beyond the level of outer end of cell 1st *M*<sub>2</sub> ; veins dark brown, a little paler in the ground areas. Venation : *Sc* relatively short, *Sc*<sub>1</sub> ending shortly beyond origin of *Rs*, *Sc*<sub>2</sub> before this origin ; *R*<sub>5</sub>

strongly arcuated to almost square at origin;  $R_2$  at end of  $Rs$ , in direct transverse alignment with remainder of cord; vein  $R_3$  oblique;  $R_5$  fused with  $M_{1+2}$  along the cephalic face of cell 1st  $M_2$ ;  $m cu$  about one-third its length beyond the fork of  $M$ .

Abdominal tergites blue-black, the sternites beyond the base with obscure yellow posterior borders. Sternal pocket of fifth segment longer and with more abundant setæ than in *subcollaris*. Male hypopygium differing from that of *subcollaris* in several regards, especially of the basistyle and dististyles, lobe of mesal face of basistyle a slender blackened spine, inner dististyle with its outer arm a long cylindrical lobe that is more than one-half longer than the inner or rostral blade, the lobe with more numerous setæ that are well-scattered over the outer half of lobe; outer dististyle a long slender spinous point that is much longer than the apical blade of the inner dististyle.

*Hab.* Ecuador.

*Holotype*. ♂, Rio Zamora, Zumbi, altitude 700 metres, October 30, 1941 (*Laddey*)

The present fly is most closely allied to *Teucholabis* (*Paratropesa*) *subcollaris* Alexander, which differs chiefly in the hypopygial characters outlined above. It is evident that many specific characters will be found in the arrangement of spines and setæ on the sternal pockets in the males of the genus *Teucholabis*. To this date, this wealth of characters has scarcely been touched except to help delimit certain groups of species within the genus.

*Teucholabis* (*Teucholabis*) *diana*, sp. n.

General coloration of mesonotum reddish yellow, variegated with black on the cephalic half of the praescutum and on the pleurotergite; head black; thoracic pleura bicolored, the dorsal sclerites obscure yellow, the ventral ones blackened; halteres and legs black, all tarsi with the proximal segments obscure yellow; wings broad, with a strong blackish tinge, the prearcular and costal fields, together with the wing-tip and a seam along cord, more suffused; sternal pockets of male diffuse, without lateral rows of delimiting setæ; male hypopy-



gium with the mesal face of basistyle at extreme cephalic border produced mesad into strong lobe; apical spine of basistyle a strongly sinuous rod that terminates in a blackened spine; outer dististyle a broadly flattened blade, its outer margin with unusually long setæ.

*Male.* Length about 8.5 mm., wing 7.2–7.5 mm.

Rostrum and palpi black. Antennæ black throughout; basal flagellar segments oval, the outer ones more narrowed and elongate, verticils very long and conspicuous. Head black, strongly narrowed behind, anterior vertex relatively narrow, about one third wider than the diameter of scape.

Pronotum black. Mesonotum reddish yellow, variegated with black, including a conspicuous median præscutal stripe that becomes reddish and finally obsolete beyond mid-length of the sclerite. Lateral præscutal stripes indicated as dark brown transverse areas behind the humeral triangles, not quite reaching the median stripe; posterior half of præscutum uniformly of the ground-colour, posterior sclerites of notum reddish yellow, the pleurotergite chiefly occupied by a large oval brownish-black area. Dorsal pleurites, including the dorsopleural region, obscure yellow, the ventral sclerites, including the propleura, sternopleura, meron and metapleura, blackened. Halteres uniformly black, the stem short, knob very large. Legs with all coxæ and trochanters black; femora and tibiæ uniformly black; proximal two or three tarsal segments obscure yellow with narrowly blackened tips, the outer segments uniformly black; claws long and simple; legs conspicuously hairy; posterior basitarsi a little dilated and modified at extreme base. Wings broad, with a strong blackish tinge, still darker in the prearcular and costal fields, as a band along the cord, and at the wing-tip; stigma still darker brown; veins brown. Venation:  $Sc_1$  ending about opposite three-fifths the length of  $R_s$ ,  $Sc_2$  a short distance from its tip;  $R_2$  transverse, subequal to  $R_{1+2}$  and a little shorter than  $R_{2+3+4}$ ; branches of  $R_s$  generally parallel to one another for most of their length; cell 1st  $M_2$  elongate, a little shorter than vein  $M_{1+2}$  beyond it;  $m-cu$  approximately its own length beyond the fork of  $M$ .

Abdomen, including hypopygium, black. Sternal pockets of male unusually diffuse, without lateral rows of stronger setæ as usual; on sternites five and six with broad pale central areas of abundant short spinous setæ, with scattered elongate bristles on sides, not in rows; area of pocket on segment six about one-third as extensive as that of segment five. Male hypopygium with the mesal face of basistyle at cephalic border produced mesad into a strong darkened lobe; apical rod of basistyle a long, sinuous, yellow structure that terminates abruptly in a strong black spine, the surface of rod with abundant appressed setulæ. Outer disistyle a broadly flattened blade, its apex obtuse, weakly bidentate, the outer margin and surface with setæ; some of the former of unusual length being approximately as long as the style itself. Inner disistyle bilobed, the inner lobe with the apex terminating in two short blackened teeth; outer lobe short, stout, slightly arcuate, before the tip with a single short spinous seta. Ædeagus narrowed outwardly, terminating in a relatively short, stout, decurved, blackened point.

*Hab.* Ecuador.

*Holotype*, ♂, Rio Zamora, Zumbi, altitude 700 metres, October 31, 1941 (*Laddey*). *Paratopotype*, 1 ♂, November 1, 1941 (*Laddey*).

*Teucholabis* (*Teucholabis*) *diama* bears a general resemblance to *T.* (*T.*) *flavithorax* (Wiedemann) and allies, but has the male hypopygium entirely different. The peculiar flattened outer dististyle is much as in the otherwise very different *T.* (*T.*) *mendax* Alexander.

*Teucholabis* (*Teucholabis*) *jivaro*, sp. n.

General coloration polished black, the humeral and posterior portions of the præscutum more reddish; head polished black, the anterior vertex narrow; thoracic pleura black, with conspicuous areas of silvery-grey pruinosity; knobs of halteres obscure yellow; legs black; wings whitish subhyaline, unpatterned except for the small dark brown stigma; cell 1st  $M_2$  closed; abdomen black, the incisures of the more basal segments yellow; male hypopygium having the basistyle without a modified

apical spine; outer dististyle a simple rod, narrowed apically, terminating in a blackened claw, before tip with a few unusually strong setæ.

*Male*.—Length about 9 mm.; wing 7.3 mm.; antenna about 1.8 mm.

Rostrum black, shorter than remainder of head, palpi black. Antennæ black, the scape sparsely pruinose; flagellar segments elongate-oval to elongate, with conspicuous verticils, the longest ones unilaterally distributed. Head polished black; anterior vertex relatively narrow, about equal in width to the diameter of scape.

Pronotum black, the scutellum and restricted lateral pretergites yellow. Mesonotal praescutum polished black, more reddish brown on the humeral portions and again on the median area at the suture, posterior sclerites of notum black, the surface sparsely pruinose, especially the postnotum. Pleura black, with conspicuous areas of silvery-grey pruinosity, especially evident on the dorsal sternopleurite, pteropleurite and metapleura; dorso-pleural region restrictedly yellow. Halteres with stem brownish black, the knob paling to obscure yellow. Legs with fore and middle coxæ brownish black, paler apically, posterior coxæ more extensively chestnut-brown; trochanters obscure yellow; remainder of legs uniformly black; legs chiefly detached, what seems to represent the posterior leg with the proximal third of basitarsus conspicuously dilated, more than twice as thick as the remainder; apex of basitarsus with two unusually strong, spinous setæ. Wings whitish subhyaline, unpatterned except for the subtriangular dark brown stigma and a dusky suffusion at base of cell *Sc*; veins brown, those at extreme base yellow. Venation: *Sc*<sub>1</sub> ending almost opposite mid-length of *Rs*, *Sc*<sub>2</sub> about equidistant between origin of *Rs* and tip of *Sc*<sub>1</sub>; *R*<sub>2+3+4</sub> a little shorter than the slightly oblique *R*<sub>2</sub>; branches of *Rs* generally parallel to one another for most of their lengths; cell 1st *M*<sub>2</sub> relatively narrow, slightly widened outwardly, a little longer than vein *M*<sub>4</sub> beyond it; *m-cu* about one-half its length beyond the fork of *M*.

Abdomen black, the basal sternites and the incisures of the more proximal tergites yellow; subterminal segments a little brightened; hypopygium black. Sternal

pockets of male conspicuous, on fifth sternite consisting of a dense central area of long slender setæ directed caudad, on either side with five or six stronger black setæ; on sixth sternite with an oval darkened area, the surface with delicate longitudinal striae, on either side of this with a row of about six strong black setæ that are directed mesad, the more posterior ones stouter. Male hypopygium with the basistyle unprovided with a modified spine, as is common in the subgenus; on mesal face near base with a blackened scabrous flange, densely set with numerous blackened tubercles and long conspicuous setæ. Outer dististyle a moderately long, simple rod, its basal two-thirds stouter, provided with conspicuous setæ and roughened points, the distal third narrowed and bent strongly mesad, terminating in a strong blackened claw-like point; just before apex with five or six very strong and powerful setæ. Inner dististyle consisting primarily of two strongly compressed blades, the two together forming a sinuous structure, the apical beak being one of the blades, its apex simple, cultriform; posterior blade obtuse at apex. Ædeagus at tip produced into a slender blackened lateral point.

*Hab.* Ecuador.

*Holotype*, ♂, Rio Zamora, Zumbi, altitude 700 metres, October 30, 1941 (*Laddey*).

*Teucholabis* (*Teucholabis*) *jivaro* is very different from all other regional species having the body coloration polished black, the legs uniformly blackened, and the wings unpatterned. The structure of the male hypopygium, especially the lack of a modified spine or arm on the basistyle, well-distinguishes the fly from all other generally similar species.

*Gonomyia* (*Gonomyia*) *platymerina*, sp. n.

General coloration of mesonotum dark brown, very sparsely pruinose; scutellum abruptly pale yellowish white; pleura dark brown, with a conspicuous whitish longitudinal stripe, antennæ, halteres and legs blackened; legs provided with linear flattened scales, in addition to sparse normal setæ; wings strongly blackened;  $Sc_1$  ending a short distance beyond origin of  $R_s$ ;  $R_{2+3+4}$  longer

than *Rs* : cell 1st  $M_2$  closed : male hypopygium with the inner dististyle a compressed-flattened disk, its outer margin blackened and produced into a sharp black spine some distance back from tip : phallosome with two pairs of blackened spines, the outer ones acicular.

*Male.* Length about 4.5 mm. : wing 4.7 mm.

Rostrum obscure yellow : palpi black. Antennæ black throughout ; flagellar segments long-oval. Head grey.

Pronotum and pretergites white, abruptly brownish black on sides. Mesonotal præscutum and scutum dark brown, very sparsely pruinose, scutellum pale yellowish white, the parascutella darker, postnotum brown, heavily grey pruinose. Pleura dark brown, with a conspicuous whitened longitudinal stripe extending from behind the fore coxæ across the ventral pleurites to the meral region, the sternites paler brown. Halteres blackened, the extreme base of stem pale. Legs with the coxæ and trochanters dark brown ; remainder of legs dark brown to brownish black, the outer tarsal segments black ; leg-segments with abundant elongate flattened scales, in addition to the fewer normal setæ. Wings with a strong blackish tinge, the prearcular and costal fields more whitened ; stigma ill-defined, a trifle darker than the ground ; central portion of disk adjoining vein *M* a little paler ; veins brown. Venation : *Sc* short, *Sc*<sub>1</sub> ending a little beyond the origin of *Rs*, *Sc*<sub>2</sub> a short distance before this origin :  $R_{2+3+4}$  very long, gently arcuated, slightly exceeding *Rs* ; veins  $R_3$  and  $R_4$  only moderately divergent ; cell 1st  $M_2$  closed ; *m cu* a short distance beyond fork of *M* ; cell 2nd *A* relatively wide.

Abdomen, including hypopygium, brownish black. Male hypopygium with the basistyle relatively short and stout, the dististyles terminal in position. Outer dististyle a slender fleshy lobe, a trifle dilated on mesal face of basal third. Inner dististyle a shorter compressed-flattened disk, its outer edge blackened and produced into a sharp black spine before the apex ; disk and inner margin of style with numerous setæ, two of the latter longer and more fasciculate, placed some distance back from the apex of blade. Phallosome consisting of a flattened pale central blade and two pairs of rods, the outer pair of the latter

appearing as acicular spines, their outer third acutely pointed and blackened, inner rods shorter and stouter, heavily blackened, their tips acute

*Hab.* Ecuador

*Holotype.* ♂, Rio Zamora, Zumbi, altitude 700 metres, October 28, 1941 (*Laddey*).

*Gonomyia* (*Gonomyia*) *platymerina* is very different from all previously-known regional species of the subgenus, differing especially in the structure of the male hypopygium, particularly the inner dististyle and the phallosome. The linear flattened scales of the legs have not been reported hitherto in the genus, but are known to me to occur in various regional members of the subgenus while being quite lacking in others that seem to be allied

*Erioptera* (*Erioptera*) *urana*, sp. n.

General coloration of thorax dark brown, the pleura somewhat paler brown with a conspicuous blackish longitudinal stripe femora yellow, with two conspicuous brownish black rings, wings with a strong brownish-yellow suffusion, restrictedly patterned with brown, including a broad seam along cord, with isolated spots at  $Sc_2$  and tips of  $R_{1+2}$  and  $R_1$ , cell  $M_2$  open by the atrophy of  $m$ , abdomen brownish black, the elongate valves of the ovipositor yellow, the hypovalvæ blackened basally.

*Female* —Length about 5 mm., wing 3.8 mm

Rostrum and palpi dark brown. Antennæ dark brown, flagellar segments oval, with very long, conspicuous verticils. Head dark

Pronotum dark brown, paler on sides. Mesonotum almost uniformly dark brown, without a well-defined pattern præscutal setæ long and conspicuous but sparse. Pleura and pleurotergite pale brown, the former with a more blackish longitudinal stripe extending from the fore coxæ to the pleurotergite, the ventral pleurites less evidently darkened. Halteres obscure yellow. Legs with the coxæ and trochanters yellow; femora yellow, each with two conspicuous brownish-black rings, one nearly medial in position, the second much wider, subterminal, tibiæ and basitarsi brown, their tips narrowly yellowish; succeeding tarsal segments clearer yellow, the outer two

brown. Wings with a strong brownish-yellow suffusion, restrictedly patterned with brown, including a broad seam along cord, with isolated further spots at  $Sc_2$  and at tips of veins  $R_{1+2}$  and  $R_3$ ; very tiny brown marginal clouds at ends of veins  $M_3$  to 2nd  $A$ , inclusive; veins obscure yellow, dark brown in the patterned areas. Venation:  $Sc_1$  ending just before level of  $R_2$ ,  $Sc_2$  far from its tip, about opposite one-third  $Rs$ ;  $R_{2+3+4}$  a trifle longer than  $R_{2+3}$ ; cell  $M_2$  open by atrophy of  $m$ ;  $r-m$  and  $m-cu$  almost in transverse alignment; vein 2nd 4 gently sinuous.

Abdomen brownish black, the very long valves of the ovipositor light yellow, hypovalvæ blackened at their bases.

*Hab.* Ecuador.

*Holotype*, ♀, Zamora, Santiago-Zamora, altitude 1,000 metres, December 20, 1941 (*Laddey*).

*Erioptera* (*Erioptera*) *urana* is very distinct from other described regional members of the subgenus, being most similar to *E. (E.) celestis* Alexander. The biannulate femora and nature of the wing-pattern readily separate the species from all allied forms.

*Erioptera (Empeda) conangustata*, sp. n.

Size very small (wing, male, 2.7 mm.); general coloration brown; halteres brownish black, the base of stem restrictedly obscure yellow; legs brownish black, provided with linear scales, in addition to the usual setæ; wings with a strong brownish suffusion;  $Sc$  short; male hypopygium with the outer dististyle unequally branched, the longer or axial branch a gently flattened blade; lateral branch short, weakly bidentate at apex.

*Male*.—Length about 2.2 mm., wing 2.7 mm.

Rostrum brown; palpi brownish black. Antennæ of unique type broken. Head dark brown; eyes relatively large, with coarse ommatidia.

Pronotum dark brown. Mesonotum almost uniformly medium brown; scutellum and mediotergite with a darker central line. Pleura brown, the meron somewhat brighter. Halteres brownish black, the base of stem restrictedly obscure yellow. Legs with the coxæ and trochanters testaceous yellow; remainder of legs brownish black; legs

with linear scales, additional to the more sparse setae. Wings with a strong brownish suffusion, the stigma scarcely darker, veins and macrotrichia dark brown. Venation  $Sc$  short,  $Sc_1$  ending about opposite one-fifth the length of  $R_s$ ,  $Sc_2$  exactly opposite the origin.  $R_{2+3+4}$  about one-half longer than  $R_2$ ;  $R_3$  and  $R_4$  extending generally parallel to one another for the entire length of the former;  $m-cu$  at fork of  $M$ ; vein  $2nd\ A$  straight.

Abdomen, including hypopygium, brownish black. Male hypopygium with the outer dististyle a little longer than the inner, unequally branched just beyond mid-length; axial branch longest, appearing as a gently flattened blade, its apex obtuse; lateral branch short, flattened, weakly bidentate at apex. Inner dististyle a long narrow parallel-sided blade, its apex obtuse.

*Hab.* Ecuador.

*Holotype*, ♂, Rio Zamora, Zumbi, altitude 700 metres, October 31, 1941 (*Laddey*).

The most similar described regional species is *Erioptera* (*Empeda*) *boliviana* Alexander, of Bolivia, which differs especially in the much larger size, paler wings with longer fork of cell  $R_3$ , and, especially the structure of the male hypopygium, notably of the inner dististyle.

### LII.- *The Identity of the Genotype of Rhinoceros Linn.*

By R. I. Pocock, F.R.S. (Zool. Dept., Nat. Hist. Museum).

IN his very useful paper (Proc. Zool. Soc., March, 1911) dealing with the typical species of the genera of Mammalia in the 10th edition of Linnaeus's Syst. Nat., Thomas quite correctly declared the type-species of *Rhinoceros* to be *unicornis* as opposed to *bicornis*, the second species included by Linnaeus in that genus; and he was evidently under the impression that there could be no doubt about the identity of *unicornis*, since Jonston, the first author quoted by Linnaeus, gave Bengal as its locality. It may be inferred also from his text that Thomas assigned the name *unicornis* to the larger of the two Indian one-horned Rhinoceroses, as most of his predecessors had done.



But at the time of writing he must have forgotten that there are two quite distinct species of one-horned Rhinoceros in India, the one already mentioned and the smaller, the so-called Javan Rhinoceros (*sondaicus*), which has greater claim than the other to be regarded as "Bengalese" because within comparatively recent times it occurred in the Sanderbans and was killed within a few miles of Calcutta, whereas the larger species is more northern in its distribution, although it does occur in northern Bengal.

Hence it is clear that the identity of *unicornis*, as left by Thomas, was in doubt, and there was a danger that that name would have to be transferred to *sondaicus* and the name *indicus* restored for the larger species now generally known as *unicornis*.

It was necessary, therefore, to consult Jonston's volume, Hist. Nat. Quadrup., 1757, to see if he supplied any clue by which the point at issue could be settled and the disturbing change in nomenclature, above mentioned, evaded if possible. On p. 67 I find that, like most early authors, Jonston was vague on the question of the distribution of his Rhinoceros, stating under the heading *locus* that it is found in the deserts of Africa and in many places in Asia, including the Kingdom of Bengal, the latter being the first definite locality mentioned, thus justifying Thomas's verdict on that point. His description of the animal is also unsatisfactory; but his figure of it supplies at all events one feature which shows that there is no occasion to make any alteration in the accepted names of the two species of one-horned Rhinoceros.

The two well known and principal external characters by which they may be distinguished are as follows:—In the lesser, so-called Javan Rhinoceros, which was abundant in Lower Bengal, the fold of skin giving mobility to the neck passes over the spine between the nape and shoulders and the cutaneous sculpture of the body, shoulders and hips is tessellated, consisting of a network of grooves circumscribing polygonal areas of various sizes and shapes. In the greater species, typically found in the Terai, the neck-fold ceases on the side of the nape above, without passing over the spine in front of the shoulder and the cutaneous sculpture of the upper side—

consists to a great extent of smooth rounded tubercles, which have been aptly likened to the heads of boiler-rivets.

Jonston's illustration, grotesque in many respects, as was usual in those days, does not convincingly depict the differentiating feature supplied by the neck-fold : but the tubercular sculpture of the skin characteristic of the larger Terai species is very clearly shown. Happily, therefore, there is no doubt that to the latter must be ascribed the name *Rhinoceros unicornis* Linn. : and the evidence of this rests upon Jonston's figure, not upon his citation of the locality as was suggested by Thomas, who made no reference to Jonston's plate.

These particulars have been given in some detail because Jonston's volume is probably inaccessible to many students of Mammalia.

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LIII.- *New Species of Staphylinidæ (Col.) from the Falkland Islands.* By MALCOLM CAMERON, M.B., R.N., F.R.E.S.

ACTICOLA, gen nov.

In appearance somewhat like *Ocyusa incrusata* Muls. Rey, the colour and lustre similar but with narrower thorax, longer antennæ and different puncturation. Parallel; head round, exserted, the neck stout, eyes rather small, temples finely bordered below. Labrum transverse, truncate, the anterior angles rounded. Mandibles stout, the right briefly bifid at apex, the left pointed, edentate. Maxillary palpi with the 3rd segment a little longer than 2nd and thicker towards the apex, 4th subulate, scarcely half as long as the 3rd. Inner lobe of maxilla pointed, with five or six fine short spines behind the apex, towards the base with longer cilia : outer lobe broader, the apex membranous with fine short close hairs. Labial palpi small, 3-segmented, the 1st cylindrical, about twice as long as broad, 2nd short, about as long as broad, 3rd narrower and a little longer than the 2nd. Tongue narrow, simple, scarcely as long as the 1st segment of the labial palpi. Pronotal epipleura visible from the side. Mesosternum simple, its process acute, extending half the

length of the coxæ, there very narrowly separated. Abdomen parallel, the first three visible tergites transversely impressed at bases, the 5th a little longer than the 4th, the 6th margined. Tibiæ with fine close setæ. Tarsi 4, 5, 5, the anterior with the first three segments short, equal, 4th as long as the three preceding together; middle with the first four segments short, equal, 5th as long as 2nd, 3rd and 4th together; posterior with first four segments rather short, 5th as long as 2nd, 3rd and 4th together. Would appear to be near *Tarphiota* Cas. but differing in the bifid right mandible, simple tongue, short elytra, etc. Type *falklandica*, sp. n.

*Articola falklandica*, sp. n.

Black, moderately shining. Antennæ black, the first two segments reddish. Legs brownish yellow, the tibiæ infusate. Length 2.75 mm.

Head round, scarcely narrower than the thorax, eyes rather small, much shorter than the rounded post-ocular region, the disc almost impunctate, elsewhere with small close flat superficial punctures, strongly coriaceous. Antennæ with the 3rd segment shorter than the 2nd, 4th to 10th transverse, increasing in width, the penultimate about a half broader than long, the 11th as long as the 9th and 10th together. Thorax slightly transverse (3.5 : 3), the sides feebly rounded in front, almost straight and a little retracted behind, the posterior angles rounded, the sculpture as on the head. Elytra as long as and slightly broader than the thorax, transverse, not emarginate postero-externally, the punctures as close and similar to those of the thorax but rather smaller, the ground-sculpture similar. Abdomen parallel, the puncturation as on the elytra but not quite so close especially behind, the ground-sculpture similar. Pubescence throughout grey, rather short, moderately close.

♂: 6th sternite a little produced and broadly rounded.

Port Stanley, 12. xii. 14. In seaweed. Type in my collection.

*CHILODERA*, gen. nov.

Narrow, parallel, elongate, somewhat resembling *Chilopora* Kr. in build, but at once distinguished by the short

tarsi. Head oval, exserted, the neck stout. Temples much longer than the eyes, with very short border below posteriorly. Labrum transverse, truncate in front, the anterior angles rounded. Mandibles slender, pointed, prominent, each with a small sharp tooth near apex, nearer the base with an obtuse angulation, the margin between with very small close serrations. Maxillary palpi with small 1st segment, 2nd and 3rd of about equal length, the latter stouter towards the apex. 4th subulate, about half as long as the 3rd. Labial palpi with three segments, the 1st rather short, 2nd about half as long, quadrate, 3rd narrower, about as long as the 1st. Tongue very small and short, the apex with a small notch. Prosternum short, carinate. Pronotal epipleura visible from the side. Mesosternum simple, its process acute and extending about half the length of the coxæ, these very narrowly separated. Abdomen parallel, longer than the fore-parts, the first four visible tergites transversely impressed at bases, the 2nd to 5th sternites similarly impressed. 7th tergite not longer than the 6th. Legs rather short, all the tibiæ closely setiferous. Anterior tarsi short, the first four segments equal, 5th as long as the three preceding together. Middle with first four segments short, subequal, the 5th as long as the three preceding together. Posterior with the 1st segment a little longer than 2nd, 2nd to 4th equal, short, 5th as long as 2nd, 3rd and 4th together. Systematically appears allied to *Chilopora* and *Calodera*.

*Chilodera falklandica*, sp. n.

Narrow, elongate, parallel, greasy lustrous, the head and abdomen black, the 8th tergite brownish yellow: thorax and elytra dark reddish brown. Antennæ and legs reddish yellow. Length 3 mm.

Head short, oval, as broad as the thorax, eyes very small, much shorter than the post-ocular region, with superficial flat rather close punctures, coriaceous. Antennæ with the 1st and 2nd segments of equal length, 3rd very short, 4th to 10th transverse, increasing in width, the penultimate about  $2\frac{1}{2}$  times broader than long, 11th as long as 9th and 10th together. Thorax as long as broad, the sides gently rounded in front, straight and a little retracted behind, along the middle narrowly sulcate,

the sculpture as on the head. Scutellum asperately punctured, coriaceous. Elytra as long and as broad as the thorax, not emarginate postero-externally, the sculpture as on the thorax. Abdomen very finely and very sparingly punctured, the ground-sculpture as on the foreparts. Pubescence throughout yellowish, moderately close.

♂: 6th sternite triangularly produced in the middle of the posterior margin

Falkland Islands, Port Stanley, ♀. xii. 14. In seaweed. Four examples. In my collection.

LIV. *Two new Species of the Nematode Genus Heterakis*. By H. A. BAYLIS, M.A., D.Sc., Department of Zoology, British Museum (Natural History).

THE material representing the two species to be described formed part of a small collection of helminths made on the Upper Cuyuni River, British Guiana, by Dr. G. S. Carter during the Cambridge Expedition of 1933. The specimens were collected from two birds of the same species the variegated tinamou (*Crypturus variegatus*)—on July 10th. The form named *Heterakis crypturi* below was found in the small intestine of one bird and in the body-cavity of the other, in the latter case together with the species named *H. multidentata*. The worms found in the body-cavity had doubtless escaped from the intestine, probably as the result of perforation by shot.

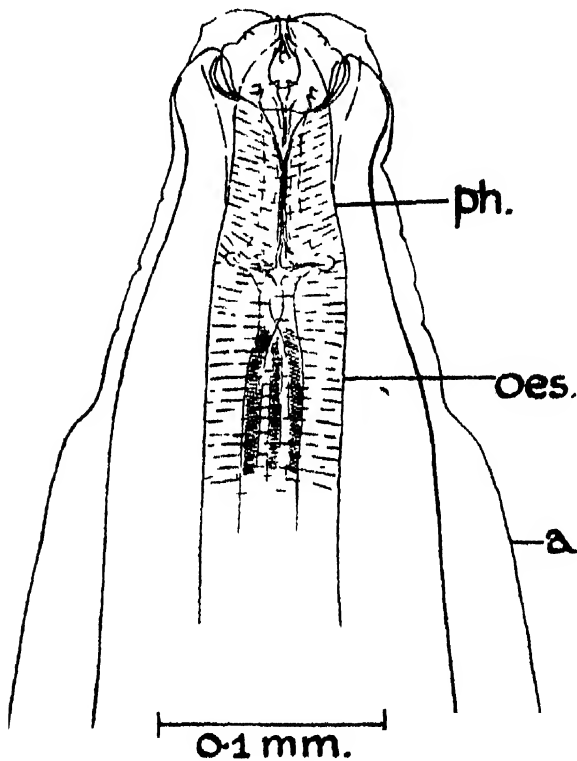
All the specimens are unfortunately in rather poor condition, having apparently been somewhat macerated before being preserved in Bouin's solution, and a large number of them had burst on preservation. The type-material is in the collection of the British Museum (Natural History).

*Heterakis crypturi*, sp. n. (Figs. 1–5.)

The male measures 5.6–6.5 mm. in length and 0.24–0.35 mm. in maximum thickness; the female 9.7–10.7 mm. and 0.34–0.37 mm. respectively. The diameter of the head, at the base of the lips, is about 0.06–0.09 mm. The anterior end of the body is invariably curved dorsally, the curvature being especially marked in the male.

transverse cuticular striations on the body are at intervals of  $25-33\mu$ . Relatively broad lateral alæ run throughout almost the whole length of the body. Immediately behind the head (fig. 1) they are narrow, but at a distance of  $0.12-0.14$  mm. from the anterior extremity in the male, or  $0.16-0.17$  mm. in the female, they increase rather suddenly in width, and their greatest width (up to  $0.05$  mm.) is attained in the oesophageal region. Cervical papillæ have not been detected. The spaces between the

Fig. 1



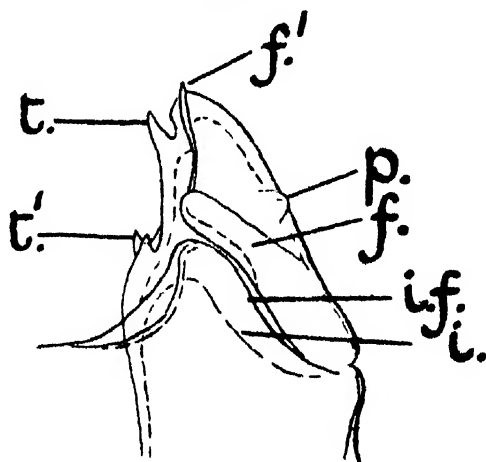
*Heterakis cryptus*. Anterior end of female; dorsal view.  
a., alæ; oes., oesophagus; ph., pharynx.

lips are covered by three broad, low interlabia (figs. 2, 3; i.) with deep cuticular flanges (i.f.). Each lip is also bordered at its sides with cuticular flanges (figs. 2, 3; f.), which almost meet those of the interlabia. Conspicuous interlabial "grooves" are thus formed at the bases of the lips, and somewhat resemble the "cordons" of those species of *Pseudaspidodera* in which these structures are

crescentic or almost straight. Each lip is also bordered anteriorly with a narrow cuticular flange (fig. 2, *f'*.), and bears on its inner surface a single, prominent, forwardly-directed tooth (figs. 2, 3; *t*.)\*.

At the back of each interlabial space, where the mouth-cavity passes into the funnel-shaped anterior portion of the pharyngeal lumen, there is a pair of smaller conical teeth (figs. 2, 3; *t'*.). Similar, but very small, teeth have also been observed by the writer in *H. gallinæ*.

Fig. 2.

50  $\mu$ .

*Heterakis crypturi*. Dorsal lip of female. m lateral view. *f*., latera cuticular flange of lip; *f'*., anterior flange; *i*., interlabium; *i.f.*, cuticular flange of interlabium; *p*., papilla; *t*., anterior tooth; *t'*., posterior teeth.

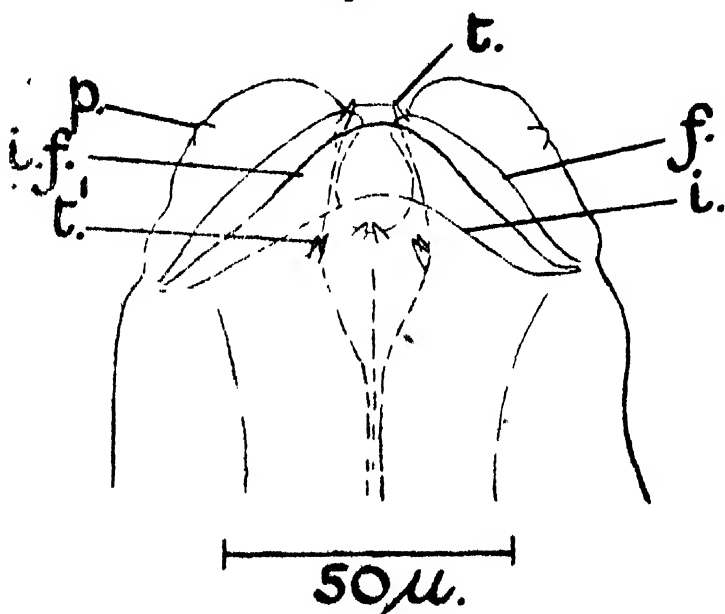
The distance from the anterior extremity to the posterior end of the oesophagus (including the bulb) is 1.3–1.4 mm. in the male and 1.6–1.65 mm. in the female. The lips and pharynx occupy about 0.08–0.1 mm. of this length.

\* A single tooth in this position on each lip has already been described in certain species of *Heterakis*, including the genotype, *H. gallinæ* (Gmelin). Graybill (1921) figures it in an immature specimen of this species, while Baker (1935) refers to the presence of two "teeth" on each lip of the adult, one in front of the other. The anterior "tooth," however (which is also figured by Graybill), appears, in specimens examined by the writer, to be the expression of an optical section of a cuticular flange bordering the lip, while the posterior tooth appears to be blind.

The oesophageal bulb measures about 0.2-0.25 mm. in length. Its maximum width is 0.12-0.15 mm. in the male and 0.18-0.2 mm. in the female. The structure of the oesophagus, with its transversely striated cuticular lining, is typical of the genus. The excretory pore is situated at 0.27-0.33 mm. from the anterior end in the male, and at 0.35-0.46 mm. in the female. The nerve-ring is slightly in front of it.

The characters of the caudal end of the male (fig. 4) are quite typical of the genus *Heterakis*. The cloacal aperture is situated at about 0.27 mm. from the posterior

Fig. 3.



*Heterakis crypturi*. Anterior extremity of female; ventral view.  
Lettering as in fig. 2.

end, this measurement including a tapering caudal filament 0.15-0.17 mm. long. The caudal alæ are well developed, and the typical twelve pairs of papillæ appear to be present. This number includes a very minute pair (the third from the posterior end) which are very indistinct and difficult to detect in the material available, and probably represent the "phasmids" of some authors. The spicules are equal or subequal in length (in the latter case the right spicule is 0.03-0.05 mm. longer than the left), and similar in form. They are relatively stout,



tubular, without alar and of a granulated appearance, and end in simple points. The right spicule is 1.13-1.7 mm. long, the left 1.08-1.7 mm. Their thickness at about the middle of their length is 0.018-0.04 mm., and they are slightly expanded towards the roots. The ring of the sucker has an outside diameter of about 0.09-0.115 mm.

Fig. 4.

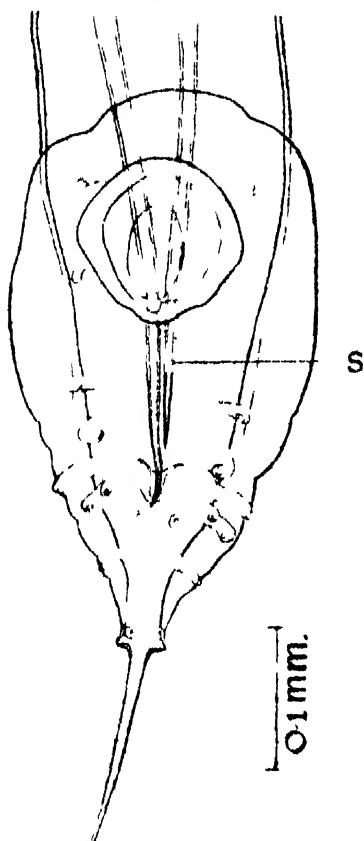


Fig. 5.

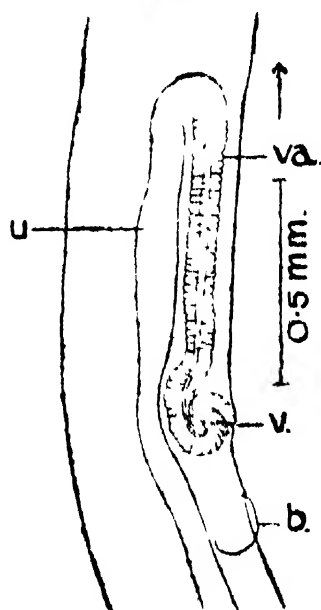


Fig. 4.—*Heterakis crypturi*. Posterior end of male; ventral view. *s.*, left spicule.

Fig. 5.—*Heterakis crypturi*. Vulvar region of female; lateral view. *b.*, cuticular boss; *u.*, common uterine trunk; *v.*, vulva; *va.*, vagina. The arrow points in the direction of the anterior end.

It is situated at a distance of about 0.08-0.11 mm. in front of the cloacal aperture. The posterior border of the latter appears to have a cuticular thickening or supporting structure which is somewhat lyre-shaped in ventral view. From ruptured specimens it is evident

that the ejaculatory duct gives off a pair of caeca, 0.6–0.75 mm. long, representing the "ejaculatory glands" described by Baker (1936) for *Heterakis gallinae*. These could not be made out *in situ* in the body in the undamaged specimens available, and their precise relationships were not determined.

The tail of the female is 0.8–0.93 mm. long, and tapers gradually to a fine point. At a distance of about 0.55 mm. from the anus a pair of small papillae ("phasmids") traverse the alae. The vulva is situated a little in front of the middle of the body, at a distance of 3.8–4.95 mm. from the anterior end. About 0.3 mm. behind it, and slightly to one side (usually to the right) of the mid-ventral line, there is a raised cuticular boss (fig. 5, *b*) with a prominent posterior edge. This boss has a transverse diameter of 0.1–0.18 mm., and does not, therefore, seem likely to have been made by the sucker of the male. Multiple bosses, such as are often present in females of *Heterakis*, have not been seen. The lips of the vulva are only very slightly prominent. In the majority of specimens (fig. 5) the vagina, after a preliminary lateral and backward curl, runs anteriorly from the vulva. (In the one exception seen, there had been a rupture of the body-wall in the posterior region.) It extends forward to a point about 0.8–0.9 mm. from the vulva, where it passes into a common uterine trunk which is capable of considerable expansion. This doubles back immediately and runs almost straight posteriorly to a point about 1.2–1.4 mm. behind the vulva. Here it doubles forward again, as a narrower tube about 0.8 mm. long, before giving off the two uterine branches. The eggs are oblong-oval and thick-shelled, with the usual internal globule at one pole. They measure 0.058–0.066 × 0.034–0.036 mm.

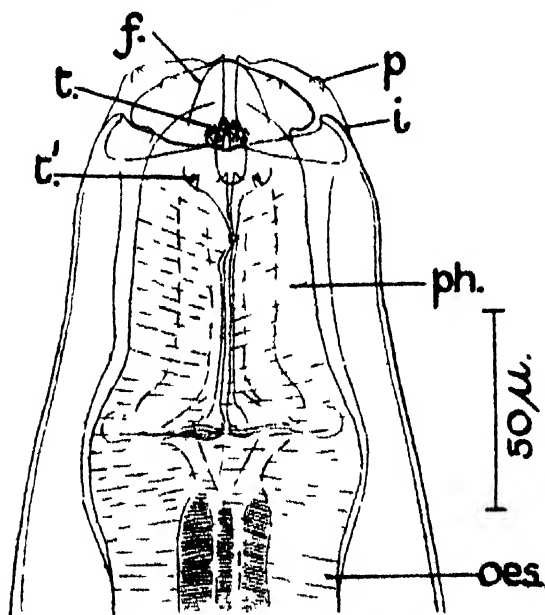
*Heterakis multidentata*, sp. n. (Figs. 6, 7.)

The male of this species measures 6.2–6.9 mm. in length and 0.27–0.3 mm. in maximum thickness; the female 7.5–7.9 mm. and 0.34–0.35 mm. respectively. The diameter of the head, at the base of the lips, is about 0.07–0.08 mm. There is a slight dorsal curvature of the body anteriorly. The cuticular striations are at intervals

of  $2.5-4\ \mu$ . Lateral alæ are present throughout the body in both sexes, but they are much narrower than in *H. crypturi*. Their greatest width (in the œsophageal region) is  $0.022-0.026\ \text{mm}$ . At a distance of  $0.2-0.22\ \text{mm}$ . from the anterior extremity slight indentations occur in the alæ which may possibly indicate the position of a pair of cervical papillæ.

Interlabia are present (fig. 6, *i*), with deep cuticular flanges that meet in pairs at the bases of the lips, producing the appearance of straight "cordons." Each lip bears on its inner surface a cuticular plate (fig. 6, *f*.)

Fig. 6.

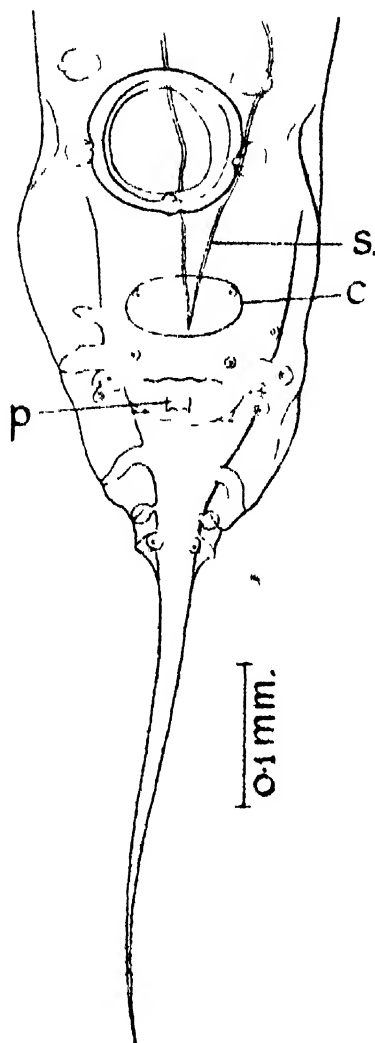


*Heterakis multidentata*. Anterior end of female; dorsal view. *f*. internal cuticular plate or flange of dorsal lip; *t.*, interlabium; *oes.*, œsophagus; *p.*, papilla; *ph.*, pharynx; *t.*, anterior teeth; *t'*, posterior teeth.

which forms a slight flange anteriorly, and further back, near the base of the lip, there is a transverse series of five forwardly-directed teeth (fig. 6, *t.*), the median tooth being much larger than the rest. At the entrance of the pharynx there are, as in *H. crypturi*, three pairs of small teeth (fig. 6, *t'*.), one pair corresponding to each interlabial space.

The length of the oesophagus, measured from the extremity of the lips and including the bulb, is about 1.3–1.4 mm. in the male and 1.4–1.5 mm. in the female.

Fig. 7.



*Heterakis multidentata*. Posterior end of male; ventral view. c., cushion-like protuberance; p., median prominence bearing two small papillae; s., left spicule.

The lips and pharynx occupy about 0.09–0.1 mm. of this length. The oesophageal bulb measures about 0.24–0.25 mm. in length, and 0.17–0.19 mm. maximum width

in the male; in the female the corresponding measurements are about 0.26-0.3 mm. and 0.2-0.21 mm. The nerve-ring is situated at about 0.27-0.3 mm. from the anterior end, and the excretory pore at 0.33-0.35 mm. in the male and at 0.38-0.39 mm. in the female.

The male has well-developed caudal alæ. The cloacal aperture is at 0.4-0.47 mm. from the posterior extremity, this measurement including a slender, tapering caudal filament 0.25-0.34 mm. long. In addition to the usual twelve pairs of papillæ there are two extra pairs of sessile papillæ on the ventral surface. One of these is situated on a transversely elongated oval cushion-like protuberance (fig. 7, *c.*) between the cloacal aperture and the sucker; the other on a small median prominence (fig. 7, *p.*) on the posterior lip of the cloacal aperture. This lip is itself rather cushion-like, and bears a pair of papillæ on its posterior surface. The pulps of the third pair of papillæ from the caudal end (the "phasmids") carry large swellings distally. The spicules are equal in length (0.38-0.48 mm.) and very slender. They are simple and tubular in the proximal quarter, where they measure about 0.008-0.01 mm. in maximum thickness, being slightly narrowed near their roots. In its distal three-quarters each spicule consists of a slender shaft and delicate alæ. The ring of the sucker has an outside diameter of about 0.09-0.12 mm. and the sucker is situated at 0.09-0.11 mm. from cloacal aperture.

The tail of the female is 0.75-0.87 mm. long, and gradually to a fine point. The caudal papilla about 0.3 mm. from the anus. The vulva is behind or slightly in front of the middle. There is no cuticular boss behind it in examined. In two out of three specimens tolerably good condition, the main direction is posterior from the vulva, while in The vagina at first takes a turn in the then doubles upon itself and, after a 0.75-0.85 mm., joins the common. The first portion of this is wide continues in the same direction as about 1.3-1.4 mm. from the vulva sharply upon itself, and at the same

narrower. The narrow portion runs back for a distance somewhat less than the length of the wide portion before giving off the two opposed uterine branches. The oblong-oval eggs measure  $0.052-0.058 \times 0.032-0.034$  mm., and show the usual polar globule at one end.

Schneider (1866) described three species of *Heterakis* from birds of the family Tinamidae: *H. alata*, *H. arquata* and *H. calvata*. Since that time two more appear to have been described—*H. brasiliensis* Linstow, 1899, and *H. skrjabini* Cram, 1927 (= *arquata* of Skrjabin, 1916, renamed). All these are much larger forms than the two described in this paper, the males ranging from 10 to 23 mm. in length and the females from 15 to 37 mm. The possibility of identifying the present forms with any of the known species of *Heterakis* from other birds has, of course, also been considered, but no description has been found to fit them. The genus *Heterakis* at present includes a large number of species, and these embrace forms with unequal and dissimilar spicules in the male (as in the genotype), and also forms with equal or subequal spicules, which may be either similar or dissimilar in shape and structure. The two species here described bear a close resemblance to some of those that have been assigned to the genus *Pseudaspidodera* Baylis and Daubney, but all the four species so assigned have unequal sp. It seems, therefore, best for the present to place the two new species provisionally in the old genus *rakis*.

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# THE ANNALS AND MAGAZINE OF NATURAL HISTORY.

[ELEVENTH SERIES.]

No. 82. OCTOBER 1944.

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LV.—*Systematic Notes on Melolonthine Beetles belonging to Holotrichia and related genera.* By GILBERT J. ARROW, F.Z.S., F.R.E.S. British Museum (Natural History).

THE genera *Holotrichia* and *Lachnysterna*, as catalogued at present, must be regarded as geographical rather than morphological entities. Described by Hope in 1837, the first for Oriental and the second for American species, they were united by Burmeister and Lacordaire, who used for them the name *Ancylonycha*, defined by Blanchard in 1845. Some recent writers have applied to the American forms another name, *Phyllophaga*, introduced by Harris in 1827, but undescribed and previously employed by Latreille as a group name, upon the ground that the requirements of the rules of zoological nomenclature that a valid generic name must have been "published and accompanied by an indication or a definition or a description" were fulfilled by Harris's mention of several species of *Melolontha* as belonging to his so-called subgenus *Phyllophaga*. Opinion 1, appended to the International Code of Zoological Nomenclature, defines the word "indication" with regard to generic names as "(1) a bibliographic reference, or (2) a definite citation of an earlier name for which a new name is proposed, or (3) the citation or designation of a type species." In Proc. U.S. Nat. Mus. 1942, p. 164, Saylor has stated that the name *Ancylonycha*, which, with many similar names hitherto unrecognised

by the catalogues in general use, was printed in 1833 in Dejean's catalogue of his collection, was validated by his inclusion of the names of described species.

The value of a name depends upon certainty as to the form to which it is applied, and this is quite absent when the name is unaccompanied by any means of identification. Many years ago, in pointing out that Hope's described genus *Stethaspis*, although a New Zealand species had been named as its type, was intended for an Australian insect, to which the name therefore belonged, I wrote "Since a mistaken identification, such as that of Hope, must always be considered possible when the founder of a genus has not had before him the type of the species upon which it is founded, a name is not entitled to recognition so long as it is unaccompanied by a definition to afford evidence of its identity. For this purpose, of course, description of the typical species or even a statement that the genus is based upon an actual type-specimen must be admitted as sufficient" (Ann. & Mag. Nat. Hist. (7) xi. 1903, p. 304). Every experienced systematist knows the frequency and, indeed, inevitability of mis-identification. It is quite possible for a name quoted as that of a species representing a new genus to prove, upon examination of the type, to belong to a different family. Saylor's view that the catalogue name *Ancylonycha* was validated by the inclusion of the names of described species appears to be a mistaken interpretation of Clause (3) of the 1st Opinion appended to the International Code quoted above. This, as Sir Guy Marshall has pointed out, does not accept the mere inclusion of the names of described species as sufficient but requires as a minimum that the type shall be fixed. This minimum requirement was not fulfilled either by Harris or Dejean in the cases in question.

The Indian *Melolontha serrata* F. was named by Hope as type of the genus *Holotrichia* and the North American *M. fervida* F. as that of *Lachnosterna*, but the characters enumerated afford no means of distinguishing generically the Old World from the New World species and I have found no sufficient reason for dividing them into two genera. The name *Holotrichia* has page priority over *Lachnosterna*.

In attempting to define the limits between *Holotrichia* and various other closely-related genera further difficulties



arise. The genus *Brahmina* was separated by Blanchard on account of its cleft (not toothed) claws and several others have been introduced for species with more than three lamellæ in the antennal club, but neither of these has proved capable of rigid application, particularly in view of the fact that both claws and club differ in certain cases in the two sexes. The absence in *Brahmina* of a continuous seta-bearing ridge upon the middle and hind tibiæ will perhaps suffice, in conjunction with its cleft claws, to distinguish it.

The number of lamellæ forming the club of the antenna has been generally assumed to be constant for each genus, but confidence in the assumption has declined as more and more species have become known.

*Hilyotrogus* Fairm., in which also the claws are cleft, was characterised as having five antennal lamellæ, the first two short, but *H. longiclavis* Bates, added subsequently, has five long joints and one short one in the club of the male and Moser (*Deutsche Ent. Zeits.* 1913, p. 276) has included in the genus various species with from three to six lamellæ, leaving no feature yet described by which it can be distinguished from *Brahmina*. The occurrence of a tibial ridge is of assistance here. Comparison of *H. longiclavis* Bates (club 6-jointed) with *Melichrus kolbei* Brsk., the type of that genus (club 7-jointed in the male, 5-jointed in the female), shows that Bates' insect could be equally well assigned to either genus, and I therefore consider *Melichrus* synonymous with *Hilyotrogus*.

The first-discovered and probably the most abundant species of *Hilyotrogus*, *H. holosericeus* Redt., of which I have examined the type, has been re-described several times. I believe *Holotrichia stridulans* Sharp and *Hilyotrogus rufoflavus* Moser to be synonyms of it. A Formosan species, described as *Heptophylla formosana* by Nijima and Kinoshita, with seven lamellæ in the male, seems to me, notwithstanding the very elongate 3rd antennal joint, better referred to *Hilyotrogus* than to *Heptophylla*.

I have recently (1941, *Ark. Zool.* 33 A, no. 8, p. 7) referred to the genus *Megistophylla*, the type-species of which has eight lamellæ in the male antenna, nine species with from five to eight lamellæ. The description by Fairmaire of his genus *Hecatomnus*, of which the only

species, *H. grandicornis*, Fairm. has five lamellæ, leaves no doubt that it must now sink as a synonym of *Megistophylla*. I have already transferred *Gymnogaster indica* Brsk. to that genus. A Formosan species called *Gymnogaster ezakii* by Nijima and Kinoshita is certainly unrelated to either of these genera. It is possibly related to *Serica*.

The Malayan genus *Pentelia* Brsk. appears to be constant in its 5-jointed antennal club, which is also peculiar for its extremely small size in both sexes. Five species of the genus have been described and another is added here. The interesting feature of a clothing of close-lying silvery-white scales upon the hind coxæ, which has been described by Moser in *Holotrichia borneensis*, is found again in *Pentelia discedens* Sharp, the type of the genus, although it has not been previously mentioned. It is here described in another species of *Holotrichia*. The close similarity in other respects also of these species of the two genera cannot escape attention and seems to point to a comparatively recent origin of *Pentelia* from the *borneensis* group of *Holotrichia*.

Closely related to *Hilyotrogus* and *Brahmina* is *Pseudo-symmachia* Dalla Torre, distinguished by having only nine joints in the antenna (of which the 3rd, 4th and 5th seem to be inseparably united). Moser has recorded (Deuts. Ent. Zeits. 1915, p. 148) that *P. chinensis* Brsk. is a synonym of *Metabolus impressifrons* Fairm., but *Metabolus* is a preoccupied name. Another synonym is *Rhizotrogus niponicus* Lewis (Japan).

The genus *Heptelia* was created by Brenske for a Bornean insect of which the male has seven antennal lamellæ and the female four. I am here adding a second species with eight lamellæ in the male and five in the female.

A genus *Atys* was established by Reiche in 1849 for the Abyssinian *A. samenensis* Reiche, the type of which, with antenna detached and separately mounted, is in the British Museum. The name *Atys* was previously used both for Molluscs and Crustacea and is not available. Another name, *Genyoschiza*, was introduced by Moser in 1917 for an East African species, *G. tarsalis* Moser, which appears to differ little from *Atys samenensis* and *Genyoschiza* may provisionally replace *Atys*. Thirteen species have been

catalogued under the last name and Andreae (Stett. Ent. Zeit. 1933, xciv. p. 104) has added to them *Schizonycha corrosa* Burm. All have been referred to the genus on account of their 9-jointed antennæ, but Péringuey has mentioned that his *Alys hypocrita* has the normal ten joints in the female. Brenske (Berl. Ent. Zeits. 1896, p. 355) has stated that, the antennæ of Reiche's genus consisting of seven joints, those with nine are not congeneric and should be regarded as forming a subgenus of *Schizonycha*. Joints 3 to 5 in *Genyoschiza samenensis* are slender and apparently not separately movable but it is doubtfully permissible to count them as a single one. Brenske's solution of the difficulty is, however, probably the best.

*Holotrichia amboinæ* Brsk. was regarded as forming a subgenus of *Holotrichia* by Brenske, who gave it the name *Amphitrichia*, but, in accordance with the uncertainty usually attending subgeneric names, this appears as that of a genus in Dalla Torre's catalogue. The Papuan region is almost outside the normal range of typical species of *Holotrichia* and, as the species is a peculiar one, least confusion will perhaps be caused by following the catalogue in raising it to the rank of a genus.

### Genus HOLOTRICHIA Hope

In the group of very closely related species represented by *H. mucida* Gyll. and *H. fissa* Brsk. the claws must be described sometimes as toothed and sometimes as cleft. In the type of *H. intermedia* Brsk. they are unmistakably of the cleft form, but in specimens from various localities in Indo-China, of both sexes and taken by Vitalis at the same time, both forms of claw occur. I believe *H. intermedia* Brsk. to be a synonym of *H. cochinchina* Nonfr. *H. cochinchinæ* Brsk., a quite different insect, may be re-named *H. moseri*, n. n.

I described a Mayalan species in 1938 under the name *Holotrichia bilobata*, but, as this name was given to an Indian insect by Moser in 1913, the Malayan species may be called *H. bilobiceps*, n. n.

Some confusion has been caused by the strong sexual difference in *Holotrichia bidentata* Burm., said to have been described from the male but really from the female, which alone has a strongly bidentate clypeus. The true

male is *Lachnosterna convexa* Sharp, which name is therefore a synonym. The very peculiar fine oblique striation of the posterior part of the elytra in the female has escaped notice. A variety with more densely punctured pronotum and elytra occurs in Tenasserim.

The Philippine *H. bipunctata* Brsk. is attributed to Java, as well as the Philippine Is., in Brenske's description, but probably erroneously. The two marginal punctures from which it was named are present only in one of the eleven examples in the British Museum. They are therefore not of any systematic significance. The antennal club of the male is twice as long as that of the female. Brenske had evidently females only, as he says that both sexes have a small oval club.

*Holotrichia nilgiria*, sp. n.

Reddish testaceous, shining, with the head darker, the abdomen and femora bright yellow, the metasternum and hind coxæ thickly clothed with tawny pubescence and the head bearing rather long erect hairs.

Oval, moderately convex, the head rather coarsely rugose, the clypeus small, rugosely punctured, straight in front, rounded at the sides; pronotum strongly punctured, sparingly in the middle, more closely at the sides, the lateral margins rounded in the middle, straight to the obtuse front and hind angles, the scutellum finely punctured; elytra moderately closely punctured, with strongly marked sutural and three narrow and imperfect dorsal costæ. Pygidium fairly strongly and closely punctured. Abdomen smooth and shining, feebly punctured. Antennæ 10-jointed. Front tibiæ sharply tridentate. Claws with strong vertical tooth, except the outer claw of the hind foot, of which the tooth is feeble.

♂. Club of the antenna as long as the footstalk.  
Length 13 mm.

SOUTH INDIA : Nilgiri Hills (*H. L. Andrewes*) ; Malabar.

This species is peculiar for the asymmetry of the claws of the hind feet, the inner claw having a strong tooth and the outer a feeble one in consequence of a thickening of its basal part. Although I have seen only male specimens, this peculiarity is not confined to that sex, for it is found also in *H. inducta* Walk., a Ceylon species of which the type and two other examples in the British Museum are

females. *H. nilgiria* is of similar size and shape to *H. inducta* but of a much lighter colour, with shining instead of dull upper surface, *H. inducta* being very closely punctured above and its elytra pruinose. The front angles of its pronotum are acute, while those of *H. nilgiria* are very obtuse.

*Holotrichia coxalis*, sp. n.

Deep mahogany-red, with the head, pronotum and scutellum rather darker, the metasternum, except in the middle, clothed with short tawny hair and the hind coxæ with closely-set silvery-white scales.

Cylindrical, rather parallel-sided, shining, with the head strongly punctured, the clypeus gently emarginate and the vertex sharply carinate; the pronotum bearing strong, rather scattered punctures, the lateral margins strongly rounded behind, straight and convergent in front, the front angles acute, produced and a little hollowed, the hind angles obsolete, the base a little impressed on each side and rounded in the middle: scutellum feebly punctured on each side and longitudinally elevated in the middle; elytra strongly but not densely punctured, each with a sutural and four other very narrow costæ. Pygidium strongly and sparingly punctured. Metasternum finely and closely punctured and abdomen finely and sparsely in the middle and rather strongly and closely at the sides. Antennæ 10-jointed, the club extremely short in both sexes. Hind tibial spurs sharp, the tarsal joints nearly equal, the claws short with strong tooth.

Length 19–22 mm.

BORNEO, SARAWAK: Quop (*G. E. Bryant*, March); junction of Tinjar and Lejok Rivers (*B. M. Hobby* and *A. W. Moore*, Aug.–Oct.).

Three specimens of each sex, attracted to light.

Like *H. borneensis* Moser, this species has the peculiar characteristic of rather densely crowded scales or setæ arranged more or less longitudinally upon the hind coxæ, to which they give a silvery appearance. There are similar, but less close and numerous, scales near the hind angles of the metasternum. The species is no doubt closely related to *H. borneensis* but has the front angles of the pronotum produced and flattened, not obtuse, and, whereas Moser's insect has the pronotum rather closely and the pygidium

rather sparsely punctured, in *H. coxalis* both are similarly and sparingly punctured. The lateral margins of the pronotum are not distinctly crenate. The new species has evidently a resemblance to *H. desiderata* Brsk., but that has the sides of the sternum and coxæ pilose.

*Holotrichia kaligoensis*, sp. n.

Reddish chestnut, not very shining, the lower surface yellow, the sternum and hind coxæ closely clothed with long tawny hair.

Cylindrical, elongate, with slender legs and tarsi, the head not large, densely, coarsely and rugosely punctured, the clypeus gently emarginate in the middle, the vertex not carinate; pronotum very coarsely and densely rugose, completely margined, the lateral margins crenate, rounded in the middle and nearly straight to the front and hind angles, which are obtuse; scutellum densely punctured, with a smooth median line; elytra strongly, not very closely, punctured, with narrow, well elevated costæ, bearing a very few scattered punctures. Pygidium finely and not closely punctured. Abdomen very smooth, scarcely punctured, except upon the last two sternites. Antennæ 10-jointed. Basal joint of the hind tarsus a little shorter than the second, the claws with a strong backwardly-directed tooth.

Length 27 mm.

JAVA: Kaligoen (F. C. Drescher, Feb.).

A single female example.

This is closely related to *H. javana* Brsk., from which it differs in being larger, a little more elongate and a little darker in colour, with the pronotum very closely and deeply rugose instead of irregularly punctured. The elytra are rather longer than those of *H. javana*, strongly but similarly punctured.

*Holotrichia vernicata*, sp. n.

Light brown above and beneath, with the head, pronotum and scutellum blackish brown, the breast rather thickly clothed with soft tawny hair.

Cylindrical, moderately elongate, shining, with the clypeus closely punctured, its front margin rather deeply notched in the middle and rounded on each side, the forehead densely and rugosely punctured and the vertex

without carina; pronotum entirely margined, coarsely and rugosely punctured, with a narrow smooth median line, the lateral margins gently rounded, deeply and rather bluntly serrate, the front angles produced, the hind angles very blunt; scutellum coarsely punctured, with the sides and apex smooth; elytra rather finely punctured, with a well-marked sutural but scarcely visible dorsal costæ. Pygidium bearing rather numerous fine punctures. Abdomen finely and sparsely punctured and very smooth in the middle, more closely at the sides, where it is setose. Antennæ 10-jointed. Legs slender, the hind tarsi with nearly equal joints. Claws with a very strong tooth.

♂. Antennal club short; hind legs very slender.

Length 21 mm.

JAVA: Preanger, 3,000–4,000 ft. (*F. C. Drescher*, March).

This species is probably related to the Bornean *H. serrulata* Brsk., but it is without a carina upon the vertex of the head. It will be recognised by the produced front angles of the thorax, the very strong serration of its lateral margins and coarsely pitted, partly rugose, upper surface, divided by a narrow smooth median line, and the elytra devoid of distinct costæ except at the sutural margin.

#### Genus *BRAHMINA* Bl.

Moser (Deuts. Ent. Zeits. 1913, p. 272) has transferred to the genus *Microtrichia* Brsk. about half of the species included by Dalla Torre, in the Junk-Schenkling Catalogue of Melolonthinæ (1912), in *Brahmina* Bl. Those still remaining under the latter name form a heterogeneous assemblage, which will no doubt be found capable of further subdivision.

#### *Brahmina nasulata*, sp. n.

Pale testaceous yellow, with the head and legs a little deeper in colour, the breast, together with the coxæ and the base of the prothorax densely clothed with moderately long and very pale hair and the elytra bearing numerous minute inconspicuous pale setæ.

Convex, elongate and shining, the head strongly and closely punctured, the clypeal margin well rounded at the

sides, nearly straight in front but elevated in the middle to form a small sharp prominence; pronotum very shining in the middle, where it is rather sparsely punctured, the punctures becoming close at the sides, the lateral margins angular in the middle and almost straight from there to the well-marked front and hind angles, of which the former are obtuse and the latter almost rectangular; scutellum bearing very few punctures; elytra bearing fairly well-marked narrow longitudinal costæ and these, as well as the intervals, rather closely punctured. Pygidium slightly elongate, feebly punctured and smooth and the abdomen beneath also smooth except at the sides. Front tibiæ sharply tridentate.

♂. Clypeus rather long, the front margin strongly reflexed. Tarsi very long and slender, the hind pair bearing a thick fringe of short hairs beneath. Antennal club moderately long.

Length 14–17 mm.

TIBET: Gyangtse, 13,000 ft., Tengkyä, 14,500 ft., Shekhar, 14,500 ft., Kyishong, 14,500 ft., Ling-Ka, 14,000 ft., Chung-Chang.

The small but peculiar feature of a sharp point in the middle of the upturned front margin of the clypeus will enable this species to be recognised without difficulty. Although occasionally indistinct and perhaps liable to abrasion, it is generally very easily seen. With the exception of the head, the surface of the body is shining above and beneath, the setæ upon the upper surface being so fine, and upon the pronotum so scanty, as to be almost invisible unless magnified. The very pale hair beneath the body and forming a fringe projecting from under the base of the pronotum, although not very long, is very soft and dense.

Considerable numbers of specimens of the species were found by Major Hingston and other entomologists accompanying expeditions to Mount Everest.

*Brahmina tibetana*, sp. n.

Dark red, moderately shining above, the breast and hind coxæ, as well as the hind margin of the pronotum, thickly clothed with pale hair and the abdomen with fairly close but very short hair. The upper surface bears rather short and scanty setæ.



Moderately elongate, rather narrow in front and broader behind, the head closely punctured, the clypeus broad, its front margin nearly straight, sometimes very feebly produced upwards in the middle; pronotum strongly punctured, the lateral margins sharply serrate, contracted and nearly straight in front and behind, with the angles obtuse, the base rounded; the scutellum bearing a few punctures; elytra showing rather ill-defined narrow costæ, which, as well as the intervals, bear fine setigerous punctures; pygidium finely punctured.

♂. Clypeus rather long, the front margin strongly raised. Antennal club not very long. Front tibiæ feebly bidentate. Hind legs very slender, the tarsi not closely fringed beneath.

♀. Clypeus shorter, the front margin less elevated. Front tibia tridentate.

Length 13–15 mm.

TIBET: Tingri, Jikkyop, 14,500 ft. (*R. W. G. Hingston*, July), Gyantse, 13,000 ft. (*H. J. Walton*, June).

Although conspicuously different in many important features, this species is closely related to *B. nasulata*. It is rather smaller and much darker coloured. The clypeus is of similar shape, with nearly straight front margin, well elevated in the male, and a median tooth is usually feebly indicated in that sex. The abdomen, including the pygidium, is well punctured and clothed with short hair, and the clothing of the upper surface, although sparse, is more apparent than in the allied species. The pronotum is strongly punctured and sharply serrated at the sides. In the male the front tibia bears only a single very feeble lateral tooth, the legs are slender but a little shorter than those of *B. nasulata* and the hind tarsi are not thickly fringed.

#### (Genus *PENTELIA* Brsk.

Three species of this Malayan genus were catalogued by Dalla Torre, two were added by Moser in 1912 and another is to be found in the British Museum collection. All have a very small antennal club, consisting of two short and three longer lamellæ. The catalogue includes Amboina as a locality for the Sumatran *P. discedens* Shp. This locality was given by Brenske in 1894, but in 1900 (*Mem. Soc. Ent. Belg.* vol. vii. p. 150) he declared the species to be

confined to Sumatra. It has also been taken in Selangor, Federated Malay States, by H. C. Abraham and C. Boden Kloss, and occurs in Java.

The six species may be distinguished as follows, the distinctive features of *P. crinifrons* and *malaccensis*, which are unknown to me, being taken from Moser's descriptions:—

- |    |   |                            |
|----|---|----------------------------|
| 1  | (2). Metasternum clothed with scales.               | <i>discedens</i> Sharp.    |
| 2  | (1). Metasternum clothed with hair.                 |                            |
| 3  | (10). Head bearing long stiff hairs.                |                            |
| 4  | (5). Pronotum and elytra bearing long sparse hairs. | <i>crinita</i> Brsk.       |
| 5  | (4). Pronotum and elytra without hairs.             |                            |
| 6  | (9). Upper surface shining.                         |                            |
| 7  | (8). Clypeus separately punctured . . . .           | <i>malaccensis</i> Moser.  |
| 8  | (7). Clypeus rugosely punctured . . . .             | <i>crinifrons</i> Moser.   |
| 9  | (6). Upper surface not shining . . . . .            | <i>densa</i> , sp. n.      |
| 10 | (3). Head without long hairs. . . . .               | <i>kinabaluensis</i> Brsk. |

*Pentelia densa*, sp. n.

Pitchy black, the metasternum clothed with moderately long and close tawny hair.

Cylindrical, rather long and narrow, very closely punctured above and not shining, with the head rugose, the clypeus short, feebly excised in the middle and strongly rounded on each side, the forehead bearing a fringe of stiff erect hairs; the pronotum finely and densely punctured, with its lateral margins crenulate, strongly angulate behind the middle and straight to the front and hind angles, of which the former are very obtuse and the latter almost obsolete, the base margined only near the hind angles; the scutellum densely punctured, except in the middle of the base, with a sharp median carina; elytra strongly, closely and evenly punctured, including the sutural costa, but with a narrow smooth sublateral costa. Pygidium strongly and irregularly punctured and abdomen beneath naked, except for a few hairs upon the first and the last two sternites.

Length 24 mm.

NORTH BORNEO: Mt. Kinabalu, Lumu Lumu, 5,500 ft. (*H. M. Pendlebury*, April).

I have seen only a single female specimen of the species, which agrees in its smooth hairless pronotum and elytra, the latter bearing only a broad sutural and narrow juxta-lateral costa, with *P. kinabaluensis* Brsk., which inhabits

the same region. It is much more elongate and the punctures of the upper surface are much finer and closer, those of the pronotum so dense as to render its surface entirely dull. The forehead bears a fringe of stiff erect hairs.

(Genus **HOLOMELIA** Brsk.

This genus was established in 1891 for a single specimen taken in Johore and contained in the Calcutta Museum. It is remarkable for possessing maxillary palpi composed of five joints, unlike any other known beetle. Whether this exceptional feature is peculiar to the male or common to both sexes has remained unknown. The discovery, not only of both sexes of that species, revealing that the peculiarity is found in both sexes, but of two other species closely related to it, is therefore of considerable interest. It is also of interest to find that, while one of the new forms has a 5-jointed antennal club, like the type-species, the other, extremely similar to it in other respects, has, in the male at least, a 6-jointed club. All three species inhabit the southern part of the Malay Peninsula. *H. mirabilis* Brsk. has been found by Mr. H. M. Pendlebury in Perak State (Larut Hills) and Selangor, the second species was taken in Pahang and a third in Selangor. The two new forms, which are a little smaller than *H. mirabilis* and without the scanty clothing of long hairs upon its upper surface, have long slender maxillary palpi, of exactly similar appearance to those of *H. mirabilis*, but the supplementary (basal) joint is much shorter, while having all the appearance of a true articulation.

*Holomelia calva*, sp. n.

Dark pitchy-red, with the head, pronotum and scutellum almost black, the upper surface hairless, the breast thickly clothed with long tawny hair, the abdomen very smooth but with sparse hairs upon the two terminal sternites, and the pygidium bearing a few similar hairs near the apex.

Cylindrical, moderately long and rather shining, the head very densely and rugosely punctured, the clypeus feebly emarginate in front, the pronotum very closely but distinctly punctured, except near the front margin, where the punctures are confluent. The sides of the pronotum are strongly angulate, the front angles very obtuse and the

hind angles obsolete. The elytra are rather closely punctured but less strongly and closely towards the apex. The pygidium is not closely punctured, the abdomen bears numerous very fine punctures beneath but those of the last two sternites are rather coarse and bear a few long hairs. The club of the antenna is 5-jointed and very short in both sexes.

Length 21-23 mm.

**MALAY PENINSULA :** Cameron's Highlands, Pahang (April, November) ; Kinta Valley, S. Perak (*H. N. Ridley*, September).

Three specimens.

As in *H. mirabilis*, the head, pronotum and scutellum are black and the elytra and lower surface deep red. The long hairs borne by the type-species upon its upper surface are entirely absent but there are a few short ones towards the end of the pygidium. The lateral fringes, as well as those upon the legs, are much shorter. The punctures of the pronotum, although dense, are distinct and not confluent as they are in *H. mirabilis*. The narrow elytra costæ are more distinct. The pygidium is finely and scantily punctured and the abdomen beneath very finely, the terminal sternite alone more strongly and closely. The 5-jointed antennal club, very short in both sexes, is a little longer in the male. The last three joints are a little longer than the two preceding them. As in *H. mirabilis*, the female has the extremity of the hind tibia much expanded and the terminal spurs broad.

*Holomelia anomala*, sp. n.

Black above, the lower surface and legs very dark reddish black, the upper surface naked, the breast clothed with rather long and close tawny hair. The abdomen is naked, with the exception of the last two sternites, which bear long but not numerous hairs.

Body cylindrical, almost parallel-sided, moderately long, rather shining, the head, pronotum and scutellum strongly and densely punctured, the clypeus feebly excised in the middle, the pronotum short, very densely and rugosely punctured in front, less densely behind, the sides strongly angulate behind the middle and almost straight to the front and hind angles, which are very obtuse ; the scutellum closely punctured ; the elytra

rather closely punctured, especially near the front margin, with a strong sutural costa, three narrow dorsal costæ and a lateral one. The pygidium is rather deeply and closely punctured and bears only a few hairs near the apex. The abdomen has only very fine scanty punctures beneath. The club of the antenna is short, 6-jointed in the male, the first joint shorter than the rest.

Length 21 mm.

MALAY PENINSULA (Ginting Bedai, Selangor, 2,000 ft. (*C. B. Kloss*)).

A single male specimen.

This species has an extremely close resemblance to *H. calva* but will be easily recognised, at least in the male sex, by the 6-jointed antennal club. The colour is darker, the upper surface is rather more closely punctured and the pygidium much more. The lower surface of the abdomen is more scantily punctured in the type-specimen. The club of the antenna, in addition to including an additional lamella, is a little longer than those of males of *H. mirabilis* and *calva*.

#### (Genus *HEPTELIA* Brsk

The only described species of this genus is *H. stripidea* Brsk. (unknown to me), the antennal club of which is composed in the male of seven lamellæ and in the female of four. The 3rd joint is elongate in the male but evidently not produced into a lamella. In a new species it forms a lamella more than half as long as the seven joints which follow, so that an 8-jointed club results. The female, instead of four joints, has five in the club, of which the first two are shorter than the rest, while the two preceding these are also feebly produced. The third joint is rather large and angular in front.

#### *Heptelia polyphylla*, sp. n.

Dark brown or reddish brown, rather darker upon the head and pronotum, the lower surface and legs a little paler, the head bearing rather scanty erect hairs and the lower surface of the body and the pygidium clothed with short but fairly close pale setæ. The elytra have also a scanty and inconspicuous clothing of short pale setæ.

Elongate, moderately shining, with the legs rather slender, the antennæ 10-jointed. Head and pronotum

strongly and fairly closely umbilicate-punctate, the clypeus short and feebly bilobed, the sides of the pronotum rounded, the front and hind angles very blunt, the elytra strongly, deeply and closely punctured, with a strong sutural costa and three narrow dorsal costae, which disappear before the extremity. Pygidium strongly umbilicate-punctate, the sides of the body beneath closely punctured.

♂. Antennæ very short, the club 8-jointed, the 3rd joint elongate, its lamella shorter than those of joints 4-10.

♀. 3rd joint of the antenna a little longer than the 2nd, 4 and 5 feebly produced, 6-10 forming the club, 6 and 7 a little shorter than 8-10.

Length 14 mm.

BORNEO : Bidi, Sarawak (*C. J. Brooks*).

Both sexes of this species will be identified without difficulty by the structure of the club of the antenna. In other respects it seems to show a close resemblance to *H. stripidea*, as described by Brenske, except that the basal joint of the hind tarsus in the female is not shorter than the second joint.

#### Genus CREPISCHIZA Brsk.

Four species of this genus have been recorded, three of them, like the two now added, having been found in Tanganyika. It is characterised by a very narrow form, especially in the male, and the produced and strongly margined clypeus in that sex. The species bear a considerable resemblance to certain narrow-bodied forms placed in the Oriental genus *Brahmina*, but differ in their scaly clothing and the evenly punctured surface of the elytra.

#### *Crepischiza pallida*, sp. n.

Pale yellow, with the head and thorax rather reddish in the female, shining above and beneath, rather closely and evenly punctured, the punctures containing white scales, which are very minute and inconspicuous upon the upper surface, larger, broader and fairly close upon the lower surface, except in the middle of the metasternum and abdomen.

The body is elongate, the front margin of the clypeus straight in the middle and strongly rounded at the sides, the sides of the pronotum angulate in the middle and nearly

straight from there to the angles, of which the front ones are acute and the hind ones sharp and rectangular, the whole upper surface closely and evenly punctured.

♂. Clypeus more rectangular, the front margin more elevated, the pronotum with the front angles produced, the elytra almost straight and parallel at the sides, the legs slender, the claws very unequally cleft, the club of the antenna long, the abdomen arched beneath and a little flattened in the middle.

♀. Clypeus shorter and flatter, its front margin less raised, the elytra rounded at the sides and broader behind, the abdomen convex beneath, the tarsi rather short, the claws deeply and almost equally cleft, the antennal club short.

Length 12-15 mm.

TANGANYIKA : Morogoro (*A. H. Ritchie*, Jan.)

Numerous specimens of both sexes were taken. It is a smaller and more closely punctured insect than *C. usambaræ* Brsk. and of paler colour than *C. ertli* and *sinuaticeps* Moser, of which the angles of the prothorax are obtuse, whilst here they are sharp, as in *C. usambaræ*. The front margin of the clypeus is straight, as in that species, and not excised, as in *C. sinuaticeps*. The entire upper surface is closely and evenly punctured, the punctures containing extremely small narrow scales. The pygidium bears rather more numerous and conspicuous scales and those of the lower surface of the body are larger, broader and more closely set, especially upon the thorax and hind coxæ. The male is much narrower and more parallel-sided than the female and, in addition to the features already mentioned, the front tibiæ are more feebly toothed and the claws only slightly cleft at the tips.

*Crepischiza pruinosa*, sp. n.

Rather dark red, with the legs pale and the elytra tawny, with a dull silky texture, the whole surface above and beneath clothed with fine but conspicuous white scales, rather close at the sides of the body beneath.

Very narrowly elongate, with slender legs, the clypeus strongly and closely punctured, its front margin elevated and nearly straight, the forehead strongly irregularly punctured and a little impressed on each side, the pronotum short and broad, closely punctured, the sides angulate in

the middle and straight to the angles, which are sharply rectangular; the scutellum strongly punctured, with the apex smooth; the elytra closely, finely and evenly punctured; the pygidium strongly and closely punctured

♂. Clypeus broad and moderately long, the club of the antenna nearly as long as the footstalk, the claws minutely cleft at the tip.

Length 14 mm.

TANGANYIKA : Morogoro (A. H. Ritchie, Jan.).

A single male specimen.

This species is not pale and shining, like the last, but very deep red in colour, with the elytra a little paler and showing a dull bloom. It is very closely and evenly punctured everywhere, except in the middle of the metasternum, and conspicuously clothed with small scales, which are dense at the sides of the thorax beneath. The shape is still more elongate than in the male of *C. pallida*, the clypeus is a little shorter than that of *C. pallida* and feebly excised in front, and the forehead bears two impressions between the eyes. The claws (of the male) are rather feebly cleft at the extremity.

NOTE.—In Ann. Mag. Nat. Hist., (11) x. 1943, p. 73, I stated that eleven joints are found in the antennæ of Lamellicorn beetles in the Geotrupinæ alone. I had overlooked the very peculiar Melolonthine *Phalangosoma mechowii* Qued.

LVI.—*New Species of South American Chrysomelidæ* (Halticinæ, Col.). By G. E. BRYANT, F.R.E.S., Imperial Institute of Entomology.

ALL the types of the new species are in the British Museum (Natural History).

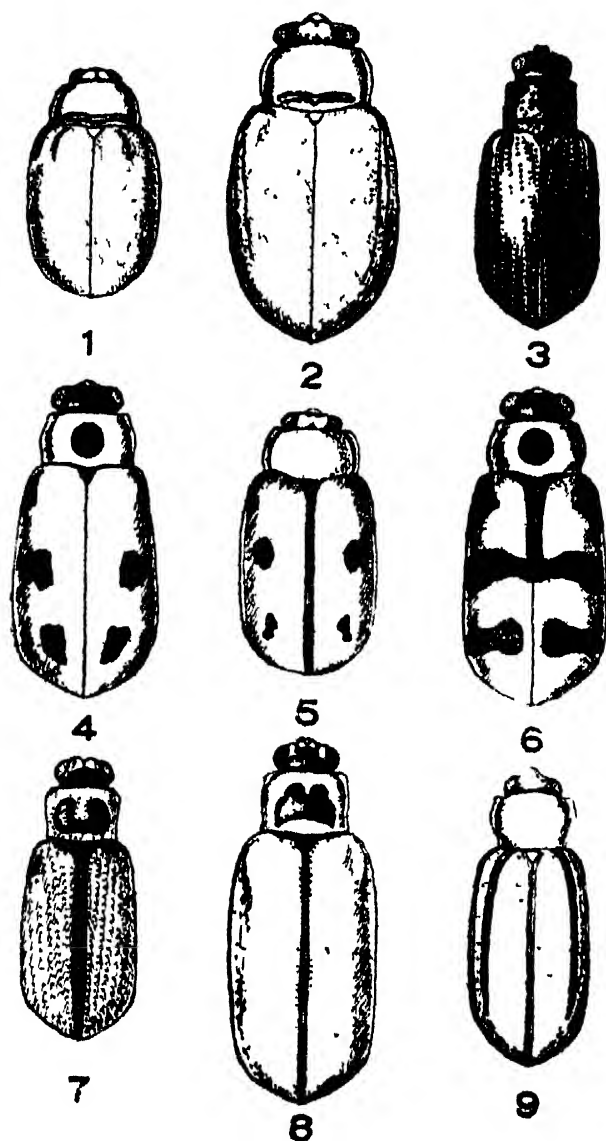
*Lactica bondari*, sp. n. (Fig. 1.)

Flavous, with the exception of the eight terminal segments of the antennæ, the anterior and intermediate tibiæ, the apical half of the posterior femora and tibiæ black, head and prothorax impunctate, the elytra closely and finely punctured.

Length 3 mm.



Figs 1-9.



1. *Lactica bondari*, sp. n.
2. *Lactica brasiliensis*, sp. n.
3. *Systena rufipes*, sp. n.
- 4-6. *Systena prasina*, sp. n.

5. *Disonychia suturalis*, sp. n.
7. *Iphitrea concinna*, sp. n.
8. *Iphitrea peruana*, sp. n.
9. *Grammicopterus striatus*, sp. n.

Head flavous, impunctate, a longitudinal median impression on the vertex. Antennæ extending to the middle of the elytra, the first segment long and slender, nearly twice as long as the second, the three basal segments flavous and more nitid than the eight terminal segments, which are black and pubescent. Prothorax flavous, strongly transverse, the sides slightly rounded and contracted in front, strongly margined, impunctate, a transverse deep sulcus near the basal margin, slightly sinuate in the middle. Scutellum flavous, triangular, impunctate. Elytra broader at the base than the prothorax, the sides almost parallel, rounded at the apex, narrowly margined, flavous, closely and finely punctured. Anterior and intermediate legs with the femora and tibiæ almost entirely black, but the basal portion tinged with flavous, the posterior femora with the apical third black, and the tibiæ with the basal portion flavous. Underside flavous, rather paler than the upper side, the ventral segments of the abdomen more or less equal.

BRAZIL: Bahia, 1930 (*Dr. G. Bondar*, No. 1585), 4 specimens.

Allied to *L. femorata* Jac., from Brazil, but differs in its more uniform and paler colour, the punctuation stronger, and colour of legs different.

*Lactica brasiliensis*, sp. n. (Fig. 2.)

Testaceous, antennæ black, with the two basal segments tinged with fuscous, legs with the basal half of the femora testaceous, the remainder black, head with a few scattered strong punctures, the prothorax impunctate, the elytra finely and closely punctured.

Length 4-4.5 mm.

♂♀.—Head testaceous, with a few strong punctures near the eyes and base, together with the eyes not as broad as the front of the prothorax, the clypeus triangular, the palpi tinged with fuscous. Antennæ long and slender, the basal segment twice as long as the second, the second somewhat oval, both black, with their apical portions testaceous, the third to the apex all about equal, black, pubescent, the apex of each segment with longer pubescence. Prothorax testaceous, nitid, transverse, the sides slightly rounded and contracted in front and margined, a deep transverse basal sulcus strongly sinuate in the

middle. Scutellum testaceous, triangular, nitid. Elytra testaceous, broader at the base than the prothorax, the sides slightly rounded and feebly carinate near the side-margins, closely and finely punctured. Legs with the femora testaceous, with the apical portion black, all the tibiæ and tarsi black, male with the first segment of the anterior tarsi dilated. Underside testaceous, the ventral segments of the abdomen clothed with fine pubescence.

BRAZIL: Bahia, 1936 (*Dr. G. Bondar*, No. 2072), 8 specimens; Guaratiba, 19. viii. 1934 (*Aristoteles Silva*), 2 specimens (Type); Ilha Santo Amaro, nr. Santos, iv. 1912 (*G. E. Bryant*), 6 specimens.

Allied to *L. geniculata* Jac., but differs in the more slender antennæ and colour of basal segment, its more rounded and more margined prothorax, and colour of legs.

*Systema rufipes*, sp. n. (Fig. 3.)

Elongate, blackish ænous, the legs red, antennæ with the six basal segments more or less rufous, the remainder fuscous, prothorax strongly punctured, the elytra finely punctate-striate.

Length 3–3.5 mm.

♂♀.—Head blackish ænous, with a small rufous spot behind each eye, and a row of strong punctures along the inner margin of the eyes. Antennæ extending slightly beyond the middle of the elytra, the six basal segments fulvous, the remainder tinged with fuscous, the first segment slightly longer than the second and more dilated, the third slightly longer than the second and equal to the fourth, the fifth slightly longer than the fourth, the remainder each about equal to the fifth. Prothorax almost quadrate, with several large irregular punctures, blackish ænous, the sides narrowly margined. Scutellum blackish ænous, impunctate, with the apex rounded. Elytra blackish ænous, much wider at the base than the prothorax, the sides almost parallel and rounded at the apex, finely punctate-striate. Legs rufous, with all the claws tipped with fuscous, the tibiæ clothed with fine golden pubescence. Underside dark ænous.

ARGENTINE: Estancia la Noria, Rio San Javier, 24. xii. 1911 (*G. E. Bryant*), 7 specimens.

Allied to *S. quadraticollis* Jac., from Panama, but larger, colour darker, the punctures on the prothorax much larger and more scattered, and legs entirely rufous.

*Systema prasina*, sp. n. (Figs. 4, 6.)

Pale olive-green, the base of the head black, a round median black spot on the prothorax, the elytra with two transverse bands and the shoulders black (typical form), or with three black spots on each, or black with the apex pale.

Length 7 mm.

Head with the basal portion black and nitid, the front greenish, with the labrum black, a longitudinal carina between the base of the antennæ, transversely impressed between the eyes. Antennæ extending to the middle of the elytra, black, the basal segment almost as long as the second and third together, the fourth to the apical segment elongate and about equal to each other, clothed with fine grey pubescence. Prothorax transverse, the sides slightly rounded and margined, the anterior angles thickened, pale olive-green, with a round median black spot, with traces of a few very fine punctures. Scutellum black, triangular, impunctate. Elytra elongate, with the sides widest behind the middle, rounded at the apex, pale olive-green, with the suture black, the shoulders and two transverse bands black, one median and the other before the apex, very finely and irregularly punctured. Legs entirely pale olive-green. Underside with the prothorax pale green, the remainder black.

The elytra vary in having three black spots on each, or in being almost entirely black with the apex pale.

BOLIVIA : La Paz (*C. Buckley*), 6 specimens.

ECUADOR : 1930 (*Gilbert Hammond*), 1 specimen.

Allied in size and structure to *G. melanocephala* Jac., from Peru, but the colour and pattern quite different.

*Disonycha suturalis*, sp. n.

Flavous, the prothorax and the side-margins of the elytra tinged with rufous, the antennæ with the segments four to ten black, the tibiæ and apical half of the hind femora black, the elytra with six small black markings.

Length 6 mm.

Head flavous, the labrum black, a few deep punctures near the eyes, and some fine punctures at the base. Antennæ extending almost to the middle of the elytra, the three basal and the apical segment flavous, the three basal with their upper surface tinged with fuscous, the first segment nearly twice as long as the second, and more dilated, the third nearly twice as long as the second, the fourth and fifth about equal, and each slightly longer than the third. Prothorax flavous, tinged with rufous, strongly transverse, the sides broadly margined, with the anterior angles rounded, impunctate. Scutellum black, triangular, impunctate. Elytra with the sides almost parallel, rounded at the apex, flavous, with the side-margins tinged with rufous, very finely and closely punctured, the suture narrowly black, a thin elongate black marking on the shoulders, a small black spot about the middle near the side-margin, and a small black marking before the apex near the side-margin. Legs with the tibiæ and tarsi black, and the apical half of the posterior femora black. Underside with the meso- and metasternum tinged with fuscous, the remainder flavous.

ARGENTINE: Estancia la Noria, Rio San Javier, 20. xii. 1911 (*G. E. Bryant*), 11 specimens.

Allied to *D. viridipennis* Clk., but differs in colour and markings. Some specimens have the median black spot missing.

*Iphitrea concinna*, sp. n. (Fig. 7.)

Elongate, above dull ivory-white, the base of the head black, a black U-shaped median marking on the prothorax, elytra with the suture black, clothed with fine depressed pubescence, punctate-striate. Legs, antennæ and underside black.

Length 4 mm.

Head ivory-white, with the basal half and the labrum black, longitudinally impressed between the insertion of the antennæ, a few punctures near the inner margin of the eyes. Antennæ black, long and filiform, extending just beyond the middle of the elytra, the first segment the longest and more dilated, the second the shortest and somewhat oval. Prothorax slightly transverse, with the sides almost straight, dull ivory-white, with a median U-shaped black marking, somewhat coarsely punctured.

Scutellum black, triangular, impunctate. Elytra with the sides widest just beyond the middle, and thence rounded to the apex, dull ivory-white, clothed with fine pale depressed pubescence, the suture black, punctate-striate. Legs and underside black.

VENEZUELA : Caracas (*Sallé*, from the Chevrolat Collection), 2 specimens (Holotype.)

COLUMBIA : Cauca Valley (*Payne*, Jacoby Collection), 2 specimens.

Allied to *I. limbata* Baly, from Columbia, but differs mainly in the pattern, with ivory-white predominant.

This species bears the MS. name *concinna* Chev., which I retain.

*Iphitrea peruana*, sp. n. (Fig. 8.)

Elongate, below black, above dull ivory-white, the base of the head and labrum black, a median black patch on the prothorax, the elytra with the suture narrowly black, punctate-striate, nitid.

Length 5 mm.

Head ivory-white, the basal half with a black triangular mark, the labrum and palpi black. Antennæ black, filiform, extending just beyond the middle of the elytra, the first segment longer and more dilated than the second, the second about equal to the third, the fourth and fifth each slightly longer. Prothorax subquadrate, the sides almost straight, but slightly contracted near the middle, the anterior angles prominent, pale ivory-white, with a median black patch, the basal margin of which is slightly inflexed, almost impunctate. Scutellum black, triangular, impunctate. Elytra with the sides more or less parallel, rounded at the apex, punctate-striate, ivory-white, without pubescence, the suture narrowly black. Legs and underside black.

PERU : Satipo, x.-xii. 1935 (*F. Waytkowski*), 4 specimens.

Allied to *L. concinna* Bry., but larger, the thoracic marking different and the thorax impunctate, the elytra without pubescence.

*Grammicopterus striatus*, sp. n. (Fig. 9.)

Elongate, flavous, with the exception of a black stria on each elytron and the antennæ fuscous, head and

prothorax impunctate, the elytra with irregular punctures, the apical portion impunctate.

Length 6-7 mm.

Head flavous, nitid, impunctate, together with the eyes narrower than the anterior margin of the prothorax. Antennæ long and filiform, extending to the middle of the elytra, the segments fuscous, the basal three tinged with fulvous, the basal segment longer than the second and third together, the fourth and fifth about equal, and each equal to the second and third together, the sixth slightly shorter than the fifth, the seventh to the eleventh all about equal. Prothorax flavous, nitid, impunctate, slightly transverse, widest just before the middle and slightly contracted to the base, the anterior angles prominent, the sides margined. Scutellum flavous, triangular, nitid. Elytra narrowly elongate, the sides almost parallel, rounded at the shoulder and apex, flavous, with a black stria extending from inside the shoulders but not reaching the apex, nearer the side-margin than the suture, irregularly punctured. Legs and underside flavous.

S. AMERICA : Rio de Janeiro (Fry Collection, British Museum), 12 specimens.

Allied to *G. flavescens* Phil., from Chile, but larger and broader, the position of the elytral striæ different, and no black marking on the prothorax.

(H. Loeblin)

LVII.—On the Genus *Peribleptus* Schönh. (Col., Curc.).

By Sir GUY A. K. MARSHALL, K.C.M.G., F.R.S.

IN his notes on the *Peribleptini*, Jekel (Ann. Soc. Ent. France (5) ii. 1872, p. 433) gave various characters distinguishing *Paipalesomus* Schönh., 1847, from *Peribleptus* Schönh., 1843; but since several additional species have been discovered, it has become clear that all these distinctions break down, and *Paipalesomus* must therefore sink as a synonym of *Peribleptus* (n. syn.).

Of the eight species dealt with here most occur in India or Burma, one is peculiar to China, one to Indo-China, and one ranges through most of the Papuan Sub-Region.

The types of three of the new species are in the British Museum, that of the fourth in the Stockholm Museum.

*Key to Species of Peribleptus.*

- 1 (16). Apical margin of prothorax vertically truncate laterally.
- 2 (5). Rostrum parallel-sided or narrowing slightly to apex; prothorax widening from apex to base, the sides straight.
- 3 (4). The two densely setose sulci on rostrum of ♀ extending from base to beyond middle, the sparsely setose sulci of ♂ more or less encroaching on the frons; elytra with the submedian oblique macular pale bands reaching stria 2 well behind middle, the basal margin strongly arcuate and sinuate near the lateral angles; India, Burma . . . . *scalptus* Boh.
- 4 (3). The setose sulci on rostrum of ♀ not extending beyond middle, those of ♂ not encroaching on the frons; elytra with the submedian oblique pale bands reaching stria 2 at about middle, the basal margin much less arcuate and not sinuate laterally; India, Burma . . *bardus*, sp. n.
- 5 (2). Rostrum widened at apex; prothorax somewhat narrowed at base.
- 6 (15). Elytra with large, somewhat irregular foveæ: legs black.
- 7 (12). Elytra thinly but uniformly clothed with short brown setæ, with two narrow oblique pale lines, the humeral calli finely rugulose and setose; sides of rostrum at base continuous with those of head.
- 8 (9). Sulci on rostrum deep and filled with dense setæ, the space between them narrower than a sulcus, subcostate and almost impunctate; female; India . . *mishmenis*, sp. n., ♀.
- 9 (8). Sulci on rostrum shallow, bare or sparsely setose, the space between them punctate; males.
- 10 (11). Space between the shallow rostral sulci broad, almost flat, narrowing behind; elytra with the foveolæ larger, more irregular, the submedian oblique line undulate, the posterior one very oblique; India . . . . . *mishmenis*, sp. n., ♂.
- 11 (10). Space between the deeper rostral sulci narrow, subcarinate, parallel-sided; elytra with the foveolæ smaller, more regular, the submedian oblique line quite straight, the posterior one almost transverse; Burma . . . . . *frenatus*, sp. n., ♂.
- 12 (7). Elytra with the setæ irregular, in spots or patches, without any oblique pale



- lines ; the humeral calli bare, shining and impunctate ; sides of rostrum forming a very shallow angle with those of the head.
- 13 (14). Space between the rostral sulci very rugosely punctate, narrowing to a point behind ; elytra with a macular band of whitish setæ across the middle and a large whitish patch on the declivity ; China ..... *foveatus* Voss, ♂.
- 14 (13). Space between the rostral sulci broad, parallel-sided, closely and finely punctate ; elytra with almost regular rows of spots formed of pale brown setæ, without whitish markings ; Indo-China. .... *eromus*, sp. n., ♂.
- 15 (6). Elytra with quite regular rows of small punctures ; legs red, with the apical third of femora and basal third of tibiæ blackish ; Burma ..... *bisulcatus* Fst.
- 16 (1). Apical margin of prothorax obliquely truncate laterally ..... *dealbatus* Bdv.

*Peribleptus sculptus* Boh.

This species is distributed throughout northern India, South-East Tibet and Upper Burma. It varies much in size and in the sculpture of the pronotum and elytra ; when long series of specimens are available, some of these forms may well prove to be local races. This may apply to *P. parallelus* Hartm., which seems to be peculiar to Assam, but I have failed to find any reliable characters by which to separate it from *sculptus*, which occurs in the same localities, and I therefore regard it as merely a variety of the latter species.

It is curious that earlier authors have made no reference to the striking difference in the sculpture of the rostrum in the two sexes.

*Peribleptus bardus*, sp. n.

♂♀. Derm black to red-brown, rather dull, thinly clothed with pale brown setæ ; elytra with an oblique submedian macular band, formed of dense whitish setæ, extending from stria 8 at one-third from base to stria 2 at about middle, and a similar parallel oblique band across the top of the declivity.

*Head* with the eyes quite flat ; frons somewhat convex transversely, with a short median stria, the rostral sulci not extending on to it. *Rostrum* curved, parallel-sided, that of ♂ with the two longitudinal sulci shallow, sparsely

setose and extending from base to beyond middle (usually nearly reaching the antennæ), the space between them broader than a sulcus, flat, parallel-sided and with fine close punctures; rostrum of ♀ similar except that the sulci do not extend beyond the middle and are filled with dense pale setæ. *Prothorax* as long as broad, rapidly widening from apex to base, with the sides quite straight, the apical margin vertically truncate laterally; dorsum varying considerably in rugosity, not or only feebly sulcate down the middle, but with a shallow median depression at the base and a strong narrow median carina that reaches neither base nor apex; pleuræ very sparsely setose, smooth and rather shiny in the middle with a few irregular punctures and usually more closely punctate towards base and apex. *Elytra* elongate, subparallel in the middle in both sexes, not widened behind, with narrow oblique shoulders, the base much less arcuate than usual and not sinuate near the lateral angles; the shallow striae with deep elongate regular punctures, the intervals broader than the septa between the punctures, interval 3 with the usual tubercle near the base. *Legs* black, finely rugulose, sparsely setose.

*Length* 7.5–10.0 mm., *breadth* 2.5–3.0 mm.

INDIA : Sikkim, Gopaldhara, 1 ♂, 1 ♀, 1916 (*H. Stevens*); Sikkim, Mungphu, 1 ♀ (*Atkinson*); Assam, N. Manipur, 1 ♂, 1 ♀, 1889 (*Doherty*); Sylhet, Chandkira, 1 ♂ (*J. L. Sherwill*). BURMA : Ruby Mines, 5,000–7,000 ft., 1 ♂, 1 ♀ (*Doherty*—type); Kambaiti, 7,000 ft., 6 ♂, v. 1934 (*Dr. R. Malaise*).

Nearly allied to *P. scalptus* Boh., which, in addition to the characters mentioned in the key, differs in being normally a much larger insect, with the bands on the elytra fulvous and more broken up.

*Peribleptus mishmensis*, sp. n.

♂♀. Derm black, thinly but almost uniformly covered with short pale brown setæ; prothorax with a denser lateral stripe of more fulvous setæ; elytra with a more or less undulate narrow submedian oblique line formed of dense white setæ running from stria 9 at one-third from the base to stria 1 well behind the middle, and a shorter parallel line across the top of the declivity from stria 6 to the suture; in specimens in good condition there are small

spots formed of a few whitish setæ immediately behind most of the foveolæ on the elytra.

*Head* with the eyes quite flat ; frons flat transversely, with a shallow median stria, the rostral sulci encroaching on it shallowly in the ♂ only. *Rostrum* curved, very gradually widening from base to apex, that of ♂ with the two longitudinal sulci rather narrower, shallower and sparsely setose, the space between them wider than a sulcus, almost flat, narrowing from apex to base, finely and closely punctate ; rostrum of ♀ with the sulci broader, deeper and filled with dense pale setæ (usually covered with yellowish powder), the space between them narrower than a sulcus, subcostate, parallel-sided and almost impunctate. *Prothorax* as long as or very slightly longer than broad, very slightly rounded laterally, widest behind the middle, the apical margin vertically truncate at the sides ; dorsum rugosely foveolate, with a broad shallow median sulcus (sometimes obsolescent) containing a fine low median carina : pleuræ opaque, finely rugulose, sparsely setose. *Elytra* opaque, elongate, slightly wider behind middle in both sexes, jointly rounded at apex, the shoulders roundly rectangular : dorsum with rows of large foveolæ that are partly somewhat irregular, the intervals being sinuous and not wider than the septa between the punctures, interval 3 with the usual tubercle near the base. *Legs* black, finely rugulose, opaque, sparsely setose.

*Length* 12–15 mm., breadth 3·5–4·5 mm.

ASSAM : Mishmi Hills, Mondon, 2 ♂, 1 ♀, iii. 1935 (*Miss M. Steele*—type) ; Mishmi Hills, Lohit R., 1 ♂, iii. 1935 (*M. S.*) ; Lohit Valley, Kahao, 4,000–5,000 ft., 2 ♀, xi. 1926 (*F. Kingdon Ward*).

In addition to the characters mentioned in the key, *P. sculptus* differs from the present species in the much wider space between the rostral sulci, which is parallel-sided or somewhat dilated behind ; the head is shorter and less narrowed in front ; the elytra are shiny, with narrower oblique shoulders, and the oblique bands are much broader and broken up into spots.

*Peribleptus frenatus*, sp. n.

♂. Very closely allied to *P. mishmensis*, sp. n., the description of which applies to it except in the following characters :—the submedian oblique pale line on the

elytra not undulate but quite straight and formed of pale yellowish setæ, and the pale subapical line much less oblique, being more nearly transverse.

*Head* rather more strongly punctate, the rostral sulci invading the frons more deeply. *Rostrum* with the two sulci deeper, the space between them not wider than a sulcus, subcarinate, parallel-sided and more strongly punctate. *Elytra* with the foveolæ somewhat smaller and more regular.

*Length* 12.5 mm., breadth 3.5 mm.

N.E. BURMA : Kambaiti, 7,000 ft., 1 ♂, v. 1934 (*Dr. R. Malaise*).

*Type* in the Stockholm Museum.

This is the only species known so far in which the space between the rostral sulci of the male is so narrow and subcarinate.

*Peribleptus foveatus* Voss.

*Paipalesomus foveatus* (*forcatus* in err.) Voss, Ent. Nachr. viii, 1934, p. 76 ; Voss, Senckenb. xix, 1937, p. 262 (*Peribleptus*).

This species is known only from China, and there are two male cotypes in the British Museum from Szechuan.

*Peribleptus erosus*, sp. n.

♂. Dull black ; prothorax with a few variable patches of pale brown setæ ; elytra with fairly regular rows of spots of pale brown setæ between the foveæ, without any transverse or oblique macular bands.

*Head* with extremely fine transverse striolation on the vertex ; frons almost flat, finely and shallowly punctate, with a shallow median stria ; eyes very slightly convex. *Rostrum* curved, distinctly narrower at base than the head, slightly widened at apex, the rostral sulci of ♂ rather broad, shallow and sparsely setose, the space between them broader than a sulcus, parallel-sided and closely finely punctate, the lateral areas closely and rather more strongly punctate. *Prothorax* as long as broad, very feebly rounded laterally, widest near the base, the apical margin vertically truncate at the sides ; dorsum coarsely rugose in the type, with a broad shallow median sulcus and a strong median carina ; cotype with the pronotum much less strongly rugose, with sparse granules, and the sulcus somewhat shallower ; pleuræ bare and shiny, with variable short

oblique striæ and sparse punctures. *Elytra* elongate, parallel, subopaque, with the apical area somewhat more produced and more acuminate than in any other species, the shoulders roundly rectangular, the base somewhat less arcuate than usual and not sinuate laterally; dorsum with rows of large foveolæ that are more or less irregular in the middle, the intervals being sinuous and not wider than the septa between the punctures, interval 3 with the usual tubercle near the base. *Leys* black, with very sparse short whitish setæ, the femora more or less wrinkled transversely.

*Length* 11.0–13.5 mm., *breadth* 3.5–4.0 mm.

TONKIN: Chapa, 1 ♂, v. 1916 (*R. vitalis*—type); Ngai-Tio, 4,800 ft., 1 ♂, vi. 1924 (*H. Stevens*).

*Peribleptus bisulcatus* Fst.

Known only from Burma.

*Peribleptus dealbatus* Bdv.

This species ranges through New Guinea, the Aru Islands, the Moluccas and the Philippines; a few specimens have also been seen from Burma.

Jekel (*op. cit.*, p. 441) gives a long list of varieties which are based almost entirely on the greater or lesser denudation of the waxy covering and the underlying pubescence.

# LVIII.—Notes on the Jurassic Flora of Yorkshire, 13–15.

By TOM M. HARRIS, University of Reading.

## 13. *Dictyophyllum rugosum* L. & H.

(Figs. 1–3.)

- 1820. *Phyllites nervulosus* Phillips (non Sternberg), p. 148, pl. viii. fig. 9. (Poor figure.)
- 1834. *Dictyophyllum rugosum* Lindley and Hutton, pl. civ. (Good figure.)
- 1836. *Phleboteris phillipsi* Brongniart, p. 377, pl. cxxxii. fig. 3 (good figure); pl. cxxxiii. fig. 1. (Same as figure of Lindley and Hutton.)
- 1856. *Dictyophyllum rugosum* and *D. leckenbyi* Zigno, pp. 176, 178; pl. xxiii. figs. 1, 1a, 2, 2a. (Good figures.)
- 1875. *Phleboteris phillipsii* and *P. leckenbyi* Phillips, pp. 202, 203, lign. 11. (Figure as Phillips, 1829.)

1900. *Dictyophyllum rugosum* L. & H., Seward (in part), p. 122; pl. xiii. fig. 3, ? text-fig. 19. (Other figures probably represent "*Clathropteris whitbiensis*.")
1922. *Dictyophyllum rugosum* L. & H., Thomas, p. 110, pl. i. figs. 1-4. (Good fertile fragments.)

Seward, 1900, gives some other references.

The following are distinct :—

*Dictyophyllum rugosum* Seward, 1900, text-figs. 17, 18, 119; pl. xviii. fig. 1. ("*Clathropteris whitbiensis*"); figure 18 is repeated in Seward, 1910, fig. 283.

*Dictyophyllum rugosum* Walkom, 1917. (More like "*Clathropteris whitbiensis*.")

*Nomenclature*.—The usual name *Dictyophyllum rugosum* L. & H. for this species is the correct one. Phillips (1829) was the first to describe a specimen of it, but he identified it wrongly with *Phyllites nervulosus* Sternberg, which name refers to a Lower Liassic leaf from Hör, perhaps *Dictyophyllum nilssoni*.

*D. rugosum* does not occur at Hör. Lindley and Hutton (1834) gave a satisfactory figure with the name *D. rugosum* and this has become accepted, though Brongniart's alternative specific name *phillipsii* was also used for a time. Seward (1900) cites the date of this name erroneously as 1828; the part of Brongniart's work containing it only appeared in 1836.

Later Zigno (1856) distinguished a certain form as *D. leckenbyi*, but that is here considered to be specifically identical. Later still Seward (1900) included in *D. rugosum* the undescribed leaf bearing the *nomen nudum* of "*Clathropteris whitbiensis*" and the name *rugosum* has come to be associated with "*C. whitbiensis*" rather than with true *D. rugosum* (Seward, 1910, Walkom, 1917).

The present note deals with the relation of the various forms of leaf that have been included in *D. rugosum* and also with the details of sporangia and spores. The material is as follows :—

1. A series of fine specimens in the Reed Collection of the Yorkshire Museum, York. They are labelled as "Middle Estuarine, Near Scarborough," and presumably were collected either from the Gristhorpe Bed or Cloughton Wyke.

2. Some rather poor specimens in the Herries Collection of the York Museum labelled Middle Estuarine, Gristhorpe.

3. Some small but well-preserved fragments collected by Mr. F. M. Wonnacott from the Gristhorpe Bed and deposited in the British Museum.

As far as we know at present, *D. rugosum* is confined to the Middle Estuarine, while "*Clathropteris whitbiensis*," which has been confused with it, is confined to the Lower Estuarine. These ranges may well be extended since *Dictyophyllum*-like fragments are widespread in this series.

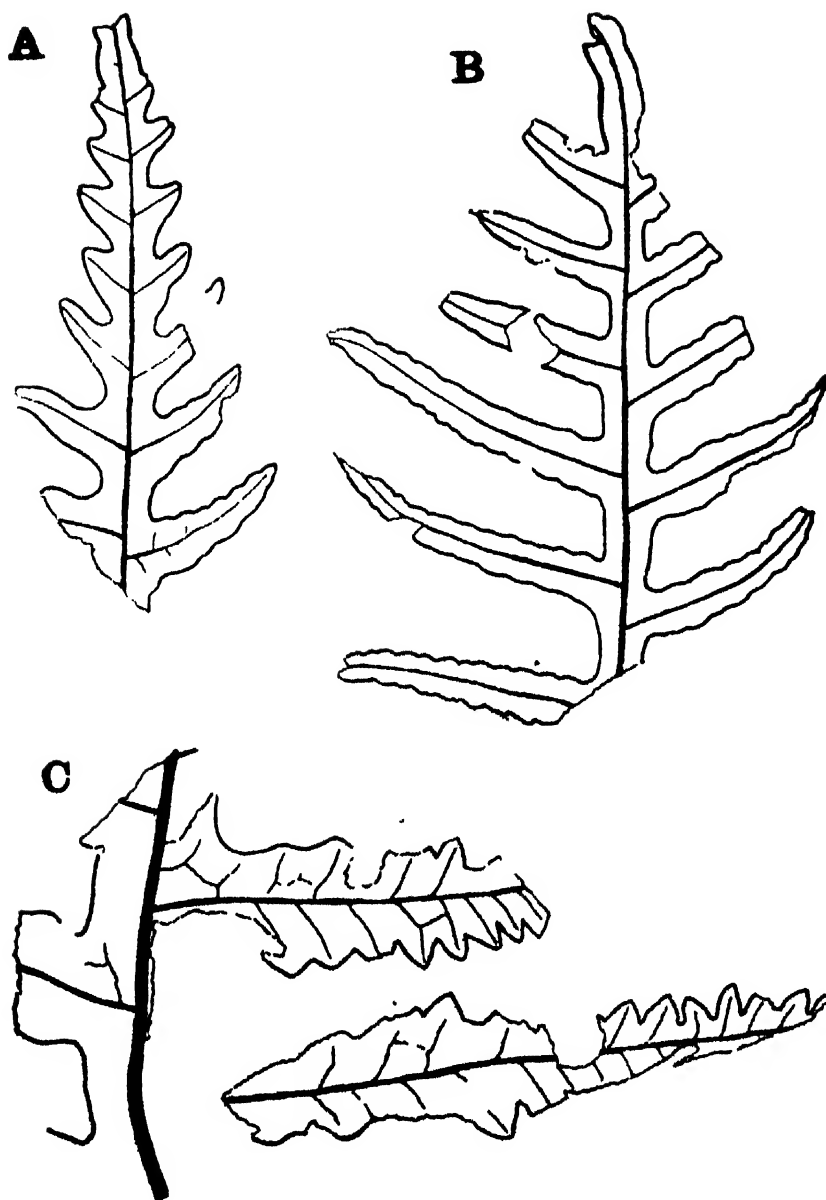
I am indebted to the Curator of Yorkshire Museum, Mr. R. Wagstaffe, for help in lending the York specimens for study and to Mr. W. N. Edwards of the British Museum for continued assistance, especially with nomenclature.

*Leaf-form*.—The material of *D. rugosum* so far discovered consists of fragments of primary leaf-segments (pinnae), and as the centre of the lamina is still unknown we can only guess that the leaf as a whole may have been like *D. nilssoni*, but rather larger.

When we try to piece together the fragments of *D. rugosum* mentally, they seem to form two slightly different sorts of leaf, not a single sort. The two are about equally common and of equal size, the difference is that in the one (*D. rugosum* of Zigno) the lamina of the secondary leaf-segments (pinnules) has angular lobes, while in the other (*D. leckenbyi* of Zingo) it is entire or undulating. Seward (1900) specifically united the two, and states that there are transitional forms. There is no doubt, however, that most specimens are of one or other kind and transitional forms are uncommon. I suggest that the leaves are slightly dimorphic, the *rugosum*-form being sterile, the *leckenbyi*-form being fertile: but my evidence is not yet fully satisfactory. I have been able to show that various fragments of the *leckenbyi*-form have ripe sporangia, by direct observation, or by macerating fragments or by making transfers. Others can be shown to have tubercles on the underside which are probably stalks of lost sporangia, but still others which showed no spores could not be sacrificed by maceration. No specimens of the *rugosum* form showed any sign of sporangia even in transfer; but this method has not been applied to all the specimens. New material is needed.

*The rugosum-form*.—The specimen shown in fig. 1C is a remarkably well-grown leaf of the *rugosum*-form with

Fig. 1

*Dictyophyllum rugosum.*

A, apex of pinna, probably sterile,  $\times 1$ . B, apex of fertile pinna, reduced to  $\frac{2}{3}$  natural size. C, middle part of sterile pinna (two other secondary branches on the right are omitted). Reduced to  $\frac{2}{3}$  natural size. All three specimens in the Reed Collection, York Museum.



secondary segments over 11 cm. long. The specimen is waterworn but representative parts of the lamina are to be seen, and the lobes are well developed except near the pinnæ rachis. The upper surface of the lamina is almost perfectly flat and where its substance has flaked off the imprint shows no trace of sporangia, nor were any found by maceration. It is almost certainly sterile.

Similar fragments, but with rather shorter secondary segments, have been figured by Brongniart, pl. cxxxiii. fig. 1, Lindley and Hutton, pl. civ., Zigno, pl. xxiii. figs. 2, 2a, Seward, pl. xiii. fig. 3.

The *leckenbyi*-form.—The specimen shown in fig. 1 B is the top of a pinna of the *leckenbyi*-form. The margin in the upper segments is almost entire but undulating in the lowest. The surface of the lamina is distinctly convex from above and when scraped off showed bodies on the under surface of sporangial size. On maceration the scrapings yielded a few *D. rugosum*-like spores. The specimen is regarded as a fertile one which has shed nearly all its spores.

Other specimens of the *leckenbyi*-form in the Reed Collection come from the middle part of the pinnæ and their secondary segments are much broader (up to 2 cm.), and the margin undulates more coarsely. In all the margin of the lamina is distinctly depressed or recurved, *i. e.* the upper surface is convex near the edges. Some of these specimens yielded abundant ripe spores when scrapings were macerated and are thus proved to be fertile, others yielded none. Of those with no spores the large specimens of the Reed Collection were not further investigated, but the small ones of the Herries and Wonnacott collections were transferred, and gave evidence of fertility in the little stumps believed to be stalks of detached sporangia, scattered over the undersurface. Most of the fertile leaves have split to expose the sterile upper surface and must be transferred to show the sporangia. However, the fragment shown in fig. 2 C, and also Thomas's fertile specimen (1922, pl. i. fig. 1), both of the *leckenbyi*-form, show the undersurface.

Specimens of *leckenbyi*-form but of unknown fertility are figured by Phillips (1829), pl. viii. fig. 9, Brongniart (1836), pl. cxxxii. figs. 3, Zigno (1856), pl. xxiii. figs. 1, 1a. An

anomalous and unique specimen is shown in fig. 1 A. It is a pinna apex with short and rather crowded secondary segments; they have an almost entire margin as in the *leckenbyi*-form, but the surface is nearly flat and there appear to be no sporangia on the underside as in the *rugosum*-form. I think that this specimen belongs to a sterile leaf of small size, borne by a young or starved plant.

*Details of lamina.*—In the strongly-lobed sterile leaf the margin of the lamina is flat, but in the fertile specimens it is seen in transfers to be sharply reflexed, the reflexed part being about 0.5 mm wide and overlaps a few sporangia. Another point shown by transfers is that while the underside of the sterile lamina is bare, in certain fertile ones it is densely covered with a layer of fine hairs or narrow scales (the cellular details are obscure). This covering occupies the spaces between the sporangia and gaps are left in it when sporangia are lost. This covering is lacking in certain specimens, where it is presumed to have been worn away. It was also noted that in the fertile specimens the surface may not be everywhere densely covered by sporangia, but near the midrib and base of the secondary segments there are sometimes large bare areas (fig. 2 C').

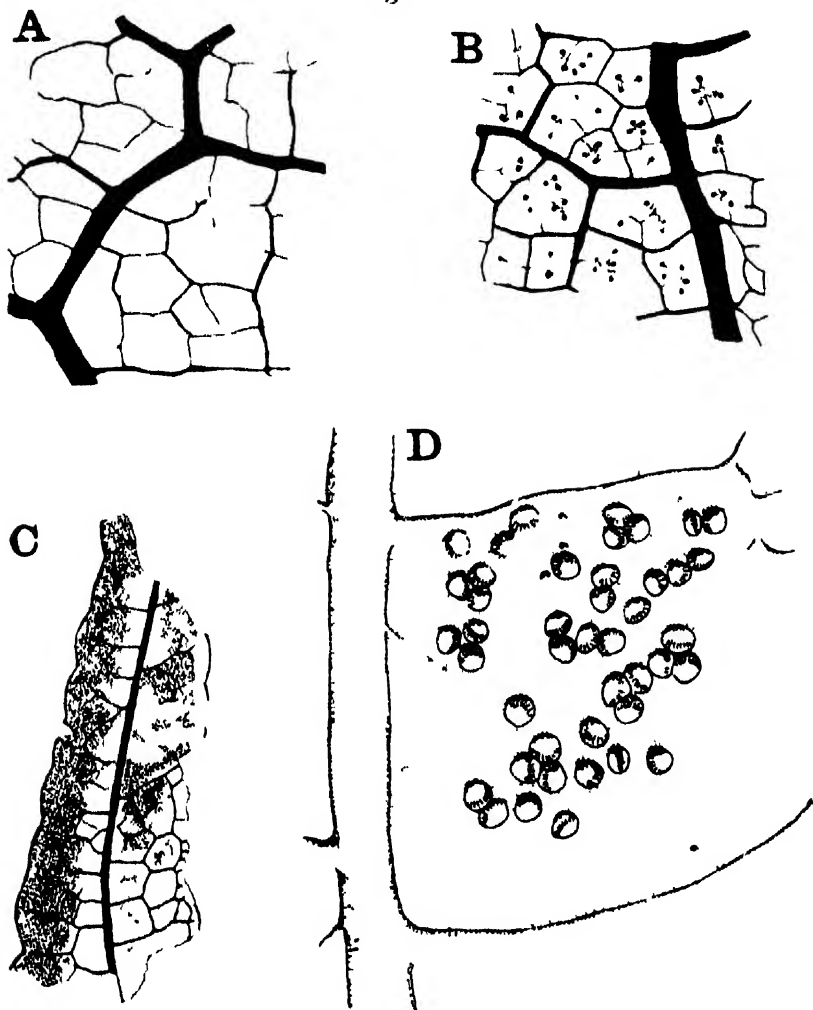
The finer venation of adjacent sterile and fertile patches of lamina is shown in figs. 2 A, B. In both, small veins end blindly in the smallest meshes and the only difference is that these veins are slender and hard to see in the sterile part, but are thickened and act as placental bundles in the fertile part.

*Sporangia.*—The arrangement of the sporangia can best be made out in specimens from which the crowded sporangia have mostly fallen off, or in those with originally few sporangia. From one to four sporangia arise on each placental vein. They arise separately, having no common tissue swelling, but are grouped because of the nature of the venation. In such groups it was noted that the sporangia are tilted from the common centre, the annulus being nearest the centre at the top of the sporangium and curving away as it runs down the sides (fig. 2 D). Such groups of related sporangia may be described as small sori, and I believe this is justified on comparative morphology.

As in other species of *Dictyophyllum* the sporangia all appear to be of identical age, and the spores when ex-

aminated of similar development. It must belong to the *Simplices*.

Fig. 2.



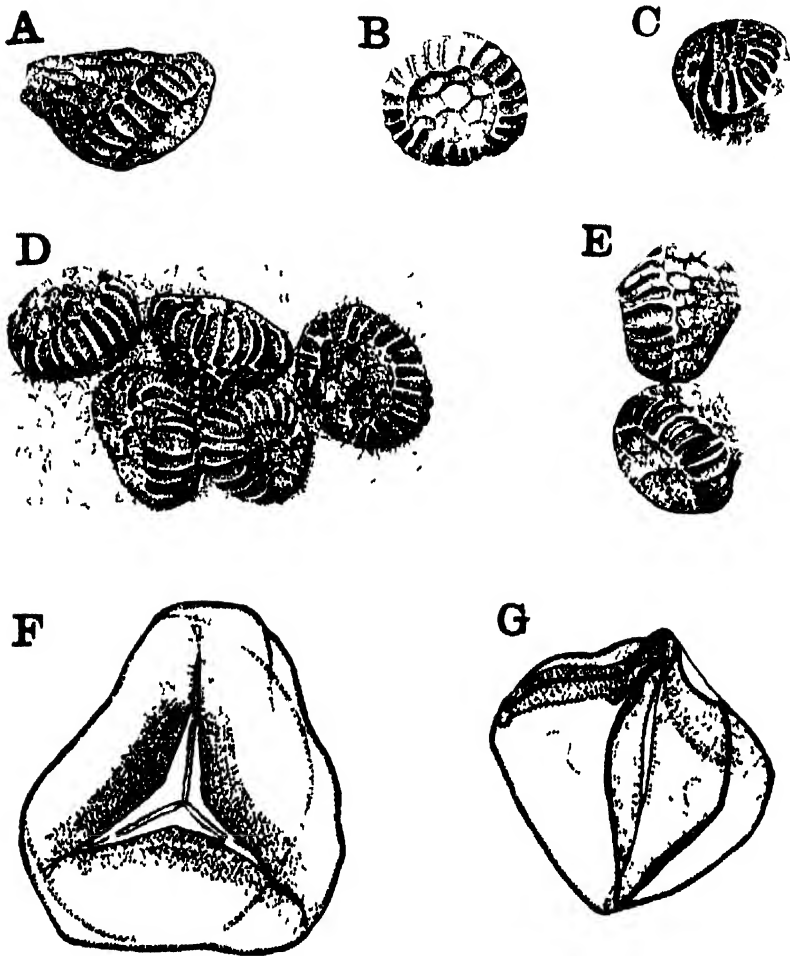
*Dictyophyllum rugosum.*

A, venation of sterile part. B, of fertile part showing bases of fallen off sporangia. Some of the small veins may have been missed. Transfer perparation, V. 25895 B,  $\times 10$ . C, isolated pinna segment showing densely fertile parts (heavily stippled), moderately fertile parts (lightly stippled) and sterile parts (blank), V. 25884,  $\times 1$ . D, one main vein-mesh from C,  $\times 10$ , showing the orientation and grouping of the sporangia (impression on rock matrix),  $\times 10$ .

It is only possible to make out certain facts about the sporangia as exposed by rock-cleavage. They are squat and almost everyone shows part, though not the whole, of

its well-developed annulus. The bases of the sporangia are hidden in rock-matrix and the doubt about the exact plane of compression of each sporangium makes their

Fig. 3.



*Dictyophyllum rugosum.*

A, side view of sporangium, transfer prep., V. 25903,  $\times 50$ . B, top of sporangium, transfer prep., V. 25895 A,  $\times 50$ . C, dehiscence of sporangium, transfer prep., V. 25903,  $\times 50$ . D, group of three sporangia and two isolated ones, V. 25892,  $\times 50$ . E, two neighbouring sporangia in side view, transfer prep., V. 25895 A,  $\times 50$ . F, spore in face view, V. 25884,  $\times 800$ . G, spore in side view, V. 25884,  $\times 800$ .

interpretation difficult. I believe this difficulty explains the difference between the account of Halle (1920), who

considered them lens-shaped with a nearly vertical, incomplete annulus, and the present account, where they are considered turbinate or almost spherical with a complete annulus. In transfer preparations these difficulties are to a large extent removed, for the sporangia are perfectly clean from matrix and the least compressed ones stand out well for study.

The sporangium is sessile and when it falls off leaves only a minute lump from its base or no projection at all. In side view (figs. 3 A, E) the lower part forms a wide cone, while the top is gently rounded. The sporangium is rounded in transverse section and arises with its axis tilted at  $45^{\circ}$  to the lamina. The annulus is a ring passing round the top of the sporangium. It is rather oblique to the sporangial axis, and is complete, although the side facing the lamina is less thickened and appears to form the stomium. The tilt in the whole sporangium and annulus in relation to the axis of the sporangium together result in the annulus being most often perpendicular to the lamina, but thanks to distortion it can be seen from all aspects but the purely ventral. In vertically compressed sporangia the end of the sporangium collapses, emphasising the completeness and rigidity of the annulus.

The annulus is seen as a band of cells with projecting sides but sunken interiors. Occasionally it is irregular or two cells wide. The other cells of the sporangium wall are also shown by their projecting sides but they are much less strongly marked. The wall-cells at the top are isodiametric, those below the annulus are rather elongated. Some sporangia have dehisced but most of these are badly torn and little use; that shown in fig. 3 C shows a longitudinal opening. The stomium is probably on the side near the lamina, where the annulus is less thickened, but no specimen shows this with certainty. It is noteworthy that for every dehisced sporangium still present there are many scars of missing sporangia, and I conclude that the sporangia normally fell off as they discharged their spores.

*Spores*.—The number of spores in *D. rugosum* was found by Thomas (1922) to be slightly over 100, approaching 128.

The spores are well cutinised and have a characteristic shape. When vertically compressed (fig. 3 F) they are often triangular with rounded ends and hollow, less often with bulging sides. The triradiate scar is very clear and

there is a strong cutinised ridge running along side it. When laterally compressed (fig. 3 G) they appear smaller and almost square, and the cutinised ridges along the triradiate scars are the most prominent feature.

*Specific comparison.*—Seward (1900) included a series of specimens of "*Clathropteris whitbiensis*" in his account of this species, and they must be separated before any strict comparison is possible. "*C. whitbiensis*" is Brongniart's manuscript name used also by Nathorst, 1880, apparently for such specimens as the leaf figured by Seward (1900), text-fig. 17; and the species has yet to be described. It appears to be a leaf of moderate size only, the secondary leaf-segments are rather crowded and the free part is scarcely if at all longer than the web along the pinna rachis. The little spots shown in Seward's text-fig. 17 are almost certainly round sori like those of *Clathropteris meniscoides*.

The Australian leaf identified by Walkom (1917) as *D. rugosum* is to be compared with "*Clathropteris whitbiensis*" and not with true *D. rugosum*.

When "*C. whitbiensis*" is excluded the true *D. rugosum* is seen to be rather like the very largest forms of the basal Liassic species *D. nilssoni* (including the *spectabile* and *hærense* forms, see Nathorst, 1906, Harris, 1931). Most specimens of *D. nilssoni* (including *acutilobum* and *obtusilobum* forms), however, come from leaves with much shorter secondary branchlets than in typical *D. rugosum*. Even in these largest specimens of *D. nilssoni* there are slight differences from *D. rugosum*, the secondary branchlets are more crowded, the margin of the fertile lamina less reflexed, the sporangia have rather more spores and the spores themselves are slightly different (see below). The sporangia, however, are similar in structure and attachment.

Preparations from Greenland material of *D. nilssoni* have been re-examined and compared with those from the Yorkshire *D. rugosum*. The mean width of the spore in *D. nilssoni* is  $37\mu$ , which is only slightly less than that of *D. rugosum* (about  $40\mu$ ) and the size range is considerable and similar in both:  $31\text{--}52\mu$  in *D. rugosum*,  $26\text{--}47\mu$  in *D. nilssoni*. Their markings are similar and plenty of spores of each can be found which match those of the other fully. A reliable difference is, however, provided by the prevailing shape, as the figures below show. Each

side of a vertically compressed spore was classed as hollow, or flat or bulging; a few only being doubtful (*e.g.* the spore shown in fig. 3 F is counted as having two hollow sides, one bulging side). Between one and two hundred spore-sides were observed for spores from each specimen, and the proportions proved almost uniform in each species and approximately as follows:—

	Side hollow.	Side flat.	Side bulging.
	%	%	%
<i>D. rugosum</i> .....	50	25	25
<i>D. nilssoni</i> .....	10	15	75

### *Comparative morphology.*

1. *Soral condition*.—In the *Dictyophyllum* alliance, certain genera, *e.g.* *Clathropteris*, *Thaumatopteris*, have large, well-spaced sori each including twelve or more sporangia. In all species of *Dictyophyllum* the sori are as a rule crowded. In *D. exile*, Nathorst distinguished sori with 4–7 sporangia, and Thomas (1922) concurred on examining fresh material, though Halle (1920) avoids confirming this statement. In *D. muensteri* the sporangia are more crowded; but in favourable places sori of about four sporangia were distinguished (Harris, 1921). In *D. rugosum*, the sporangia are sometimes attached singly, but are more often grouped in twos or threes so as to give vestigial sori. In *D. nilssoni*, where the arrangement has been described as non-soral (Harris, 1931), re-examination of the material has suggested that the arrangement is exactly as in *D. rugosum*, though the evidence is less clear, because they are less well preserved.

It would appear that there is no sharp difference between *D. nilssoni* or *D. rugosum* on the one hand and *D. exile* on the other; the sori are only slightly more reduced and more crowded. Certainly this does not constitute a generic difference between *D. exile* and *D. rugosum* (*cf.* Thomas, 1922).

2. *Sporangia*.—The sporangia of *Dictyophyllum*, which Halle considered to be of almost polypodiaceous type and not unlike those of *Dipteris* in form (though with a much larger spore output), do, in fact, differ considerably. The sporangia share the characters of certain families of the Simplicies without being exactly like any one: they

are something like those of *Aneimia*, of the Schizæaceæ, but differ in having a much larger apical region above the annulus, and they are something like those of *Gleichenia*, but differ in the orientation of the annulus. It is possible that such sporangia as those of *Dictyophyllum* could have evolved into the polypodiaceous type of *Dipteris*, but to do so they must have changed more than had been realised. Halle, after careful consideration, decided for *D. exile* that the annulus was incomplete, though oblique. In his specimens, however, it is only the strongly-thickened cells of the annulus which are distinguishable, any weakly-thickened wall-cells being scarcely visible. I suggest that the "gap" in *D. exile* is probably occupied by weakly-thickened stomium cells. Such cells are normally reckoned as part of the annulus, and their existence does not make an annulus incomplete. An "incomplete" annulus normally means one where the annulus begins and ends at the sporangial stalk.

*Appendix.*—The use of spore-size.

The fertile specimens of *D. rugosum* gave an opportunity to investigate the value of measurement of spore-size to distinguish allied species. Accordingly spores were prepared from each specimen in the Wonnacott collection by the usual method ( $\text{KClO}_3 + \text{HNO}_3$ , followed after several hours by  $\text{NH}_4\text{OH}$ ), and a considerable number of good spores, 60–80 for each specimen, were measured. The mean diameters in  $\mu$  for six specimens are as follows:—39.8, 40.4, 40.6, 41.1, 42.0, 42.2. In each case the standard deviation is approximately  $4\mu$ . The corresponding figures for a Greenland Liassic specimen of *D. nilssoni* are  $37.1\mu$ , standard deviation  $4.3\mu$ .

From the statistical tables, the significance value can be calculated of the difference between these means, 37.1, S.D. 4.3 (68 measurements) and 40.6, S.D. 4.0 (63 measurements). The difference appears to be highly significant, i.e. the chance that the true value of these means is the same is less than 1:1000. Unfortunately, the difference between the means 39.8 and 42.2, both of *D. rugosum*, is also significant. The explanation is probably that, in addition to original variation in the material, there is variation due to differences of preservation and subsequent treatment in preparation, and that these differences of prepara-



tion act unequally on the different specimens. Maceration is known to cause cuticles to swell and accordingly sporangia from the specimen which gave spores  $40.6\mu$  wide were deliberately over macerated. Then in ammonia they swelled strongly and their mean diameter became  $58.8\mu$ . These spores were bleached and had suffered considerably, becoming so soft as to be difficult to mount. This swelling therefore, about 30 per cent. increase beyond the previous size, is the limit to what could occur and be observed in this way. Their shapes were not altered.

Such severe over-maceration should be, and normally is, avoided. I have evidence also that as the time of maceration is extended, the swelling effect is at first slight and only becomes great as the point is approached when the cuticle is destroyed. The spores with a mean size  $39.8\mu$  and those  $42.2\mu$  both appear suitably macerated, and I suggest that this difference of  $2.4\mu$  (6 per cent.) may give the approximate limit of discrepancy to be expected between mean sizes of spores when prepared by maceration with ordinary care. This inference could be tested by the examination of numerous samples from one specimen, but the result would not be likely to justify the labour. It is impossible to standardise maceration procedure fully because different specimens need different treatment to bring them into a corresponding state, thus involving the uncertainty of judgement.

### *Conclusions.*

1. In comparing mean sizes of spores, both specimens should be macerated as gently as possible. Over-maceration causes swelling to the extent of up to 30 per cent.
2. In ordinarily careful maceration differences caused by swelling should not exceed 6 per cent.
3. It follows that slight differences in mean size are of less certain value than slight differences of average shape, these not being altered by maceration.

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#### 14. The *Baiera gracilis* complex.

As Seward wrote in 1900 (p. 264): "The form of leaf represented by *Baiera gracilis* Bunb. is one which was very widespread in Mesozoic times . . ." but the name has only been applied to Yorkshire specimens, and later to ones from E. Asia and to one from Alaska. Some names which have been given similar looking leaves from other regions are mentioned by Seward (1919, p. 46) and Florin (1936). Detailed investigation shows that the Yorkshire material includes two species, and there is a third from E. Asia: very likely there will prove to be others. Their separation depends on laboratory preparation of the cuticles and therefore only well-preserved leaves are determinable.

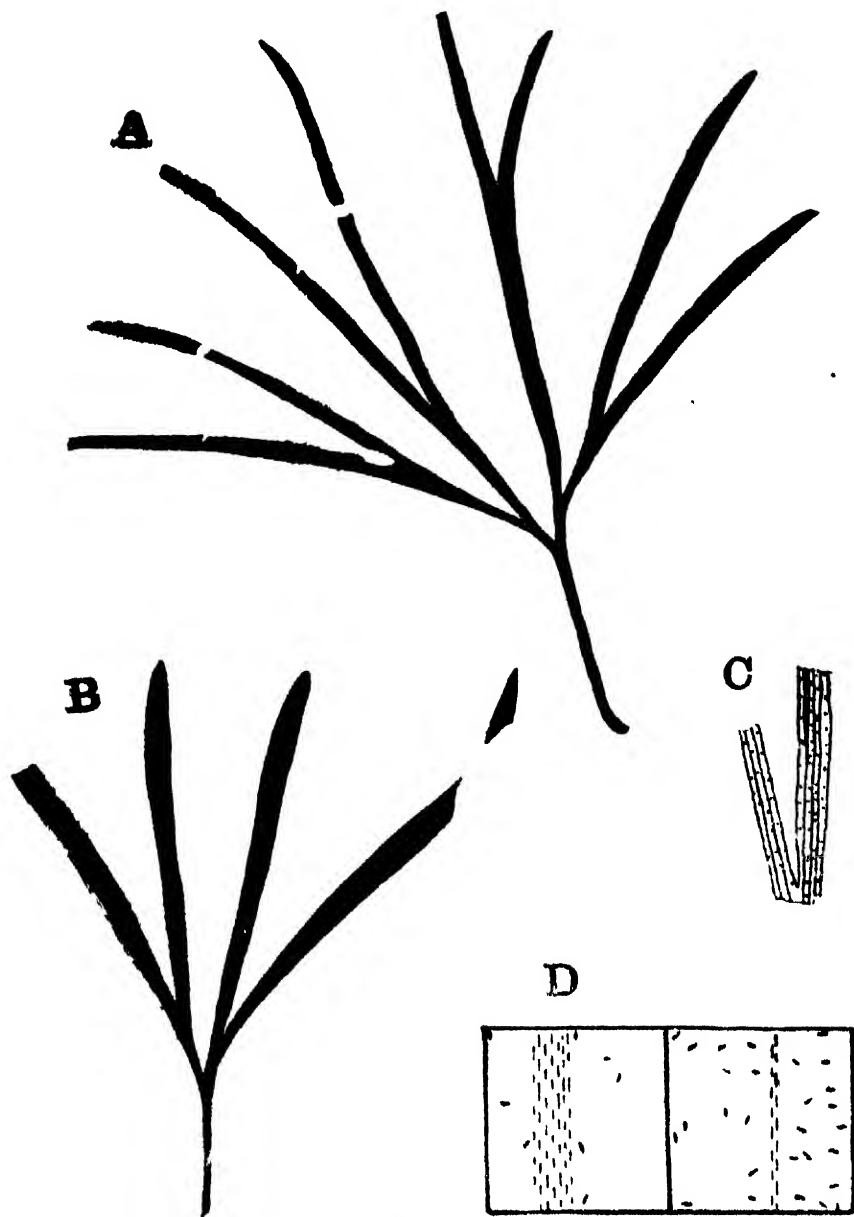
A list of specimens so far identified as *B. gracilis* follows: no view is expressed about the precise identity of those whose cuticles are unknown.

Specimens figured under the name *Baiera gracilis*:—

##### 1. Yorkshire.

1851. Bunbury, p. 182, pl. xii. fig. 3. (Type-specimen.)
1884. Sappora, p. 277, pl. clvii. fig. 4; pl. clviii. figs. 1–3. (Good leaves from Yorkshire.)
1900. Seward and Gowan, pl. x. fig. 68. (Same specimen in Seward, 1900, pl. ix. fig. 3, but differently drawn.)
1900. Seward, p. 268, pl. ix. figs. 3, 5.
1919. Seward, p. 45, figs. 649 (Bunbury's type), 650 (re-drawn from Seward, 1900, pl. ix. fig. 5), 651 (re-drawn from specimen in Seward, 1900, pl. ix. fig. 3).
1929. Black, p. 422, figs. 8–12 (form, cuticle, occurrence).

Fig. 4.

*Baiera gracilis.*

A, V. 6475,  $\times 1$ . B, V. 10376,  $\times 1$ . C, fragment from V. 6475 (slide A) cleared to show veins and resin bodies. D, two sq. mm. of cuticle of *B. gracilis*, upper side on left, lower side on right. Short black lines represent apertures of stomata, broken vertical lines represent regions modified in relation to a vein, V. 6475, slide B.

## 2. E. Asia.

1906. Yokoyama, p. 30, pl. ix. fig. 2 a. (China.)  
 1908. Yabe, p. 5, pl. i. fig. 3 c; pl. ii. fig. 5 c. (China.)  
 1925. Kawasaki, p. 46, pl. xxiv. figs. 72-74; pl. xxv. figs. 75-77;  
 pl. xxvi. figs. 78, 79. (Korea.)  
 1926. Kawasaki, p. 31, pl. ix. fig. 25. (Korea.) (Oishi, 1932, pp. 347,  
 354, criticises Kawasaki's determinations.)  
 1933. Sze, p. 16, pl. vii. figs. 1-3, 4. (China.)  
 1933. Yabe and Oishi, p. 217, pl. xxxii. figs. 13 b, 14, 15; pl. xxxiii.  
 fig. 5. (Manchuria.)  
 1933. Oishi, p. 242, pl. xxxvi. figs. 4-7; pl. xxxix. figs. 5-7. (Manchuria.)  
 1940. Oishi, p. 371. (Discussion of certain Asiatic specimens.)

*Baiera gracilis* Bunbury (*sensu stricto*).

(Figs. 4, 5, 6 A.)

1851. *Baiera* ? *gracilis* Bunbury, p. 182, pl. xii. fig. 3. (Specimen  
 previously given MS. name of *Schizopteris gracilis* by Bean.)  
 1919. *Baiera gracilis* Bunb., Seward, p. 45, text-fig. 649. (Bunbury's  
 type re-drawn; ? figs. 650, 651.)  
 1929. *Baiera gracilis* Bunb., Black, p. 422, figs. 8-12.

Other specimens (mentioned above) may belong to *B. gracilis* in the strict sense. The female fructification attributed to *B. gracilis* by Black (1929) merits description under a special name.

The material here described belongs to various collections and is as follows :—

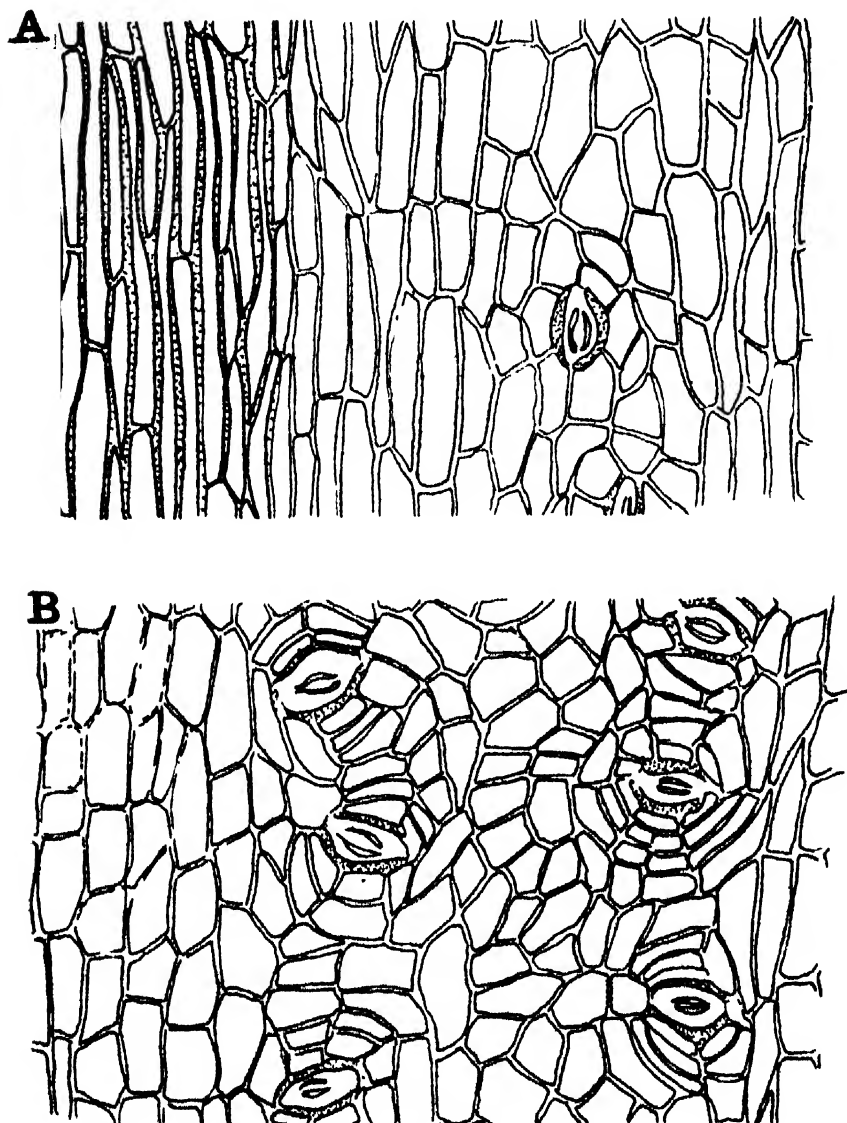
1. The type-specimen (Bunbury Collection, Botany School Museum, Cambridge), a block showing six leaf-fragments in addition to the type.
2. Two blocks in the Geology Dept., British Museum, showing four good leaves.
3. Five blocks in the York Museum showing six good leaves and some fragments.
4. One block with one leaf in the collection of Dr. M. Black.

One specimen is labelled " Lower Estuarine, Haiburn Wyke "; most of the others are labelled " Lower Estuarine, near Scarborough "; a few have no labels. The designation " Near Scarborough " was formerly used to cover almost any of the Yorkshire Jurassic Plant localities. Black's specimen is from The Upper Estuarine of Scalby Wyke, Nr. Scarborough.

*Emended diagnosis*.—Petiole slender, base expanded. Lamina as a whole forming a broad wedge of 60°-140°, nearly flat, deeply divided into 4-12 narrow segments,

which taper from their widest point (near their middle) to an acute apex. Veins inconspicuous, 2-4 present in lower parts, 4-6 in upper part of a segment, converging but not

Fig. 5.



*Baiera gracilis.*

A, upper cuticle ; B, lower cuticle, V. 6475, slide B,  $\times 200$ .

\* A vein lies on the left in each.

actually meeting at the apex. Numerous minute oval resin masses between veins.

Cuticle fairly thick ( $4\mu$  above,  $2\mu$  below), stomata occurring sparsely above (10 per sq. mm.), more frequently below (35 per sq. mm.); more numerous than this near the leaf-apex.

Upper cuticle showing long, narrow cells along veins, gradually replaced by shorter and wider ones between the veins; stomata confined to a region midway between veins. Lateral walls of cells broad, straight, conspicuous, surface typically flat, rarely papillate; surface-sculpture of obscure mottling. Stomata longitudinal or variously orientated, details as for lower side except that the guard-cells are less exposed and encircling cells less often developed. Trichomes absent.

Lower cuticle showing narrow and ill-defined zones along veins, without stomata, and broad intervening zones with evenly scattered stomata. Cells along the veins varying from square to moderately elongated, forming longitudinal rows. Cells between the veins irregularly polygonal, often transversely elongated. Lateral walls of cells fairly broad, conspicuous, typically straight. Surface of cell typically flat and without any papilla, rarely showing an ill-defined median thickening. Stomata scattered, transversely or irregularly orientated. (Guard-cell surface partly or largely exposed. Subsidiary cells forming an oval or irregular group: inner walls (forming the stomatal pit) sometimes much thickened to form a continuous entire rim, sometimes rim somewhat lobed to form incipient or well-developed inwardly directed papillæ. Surface of subsidiary cell typically flat and unthickened, occasionally somewhat bulging and thickened to form a more or less marked surface papilla. Unspecialised lateral encircling cells usually present and occasionally second encircling cells, polar encircling cells absent. Trichomes absent. (One small conical trichome was seen on one specimen.)

*Discussion.* -Of the numerous specimens on which this description is based, two (V. 6475 and Black's specimen) are excellently preserved, but the others, though perhaps originally good, have lost the cuticle on the side of the leaf exposed by splitting (see below).

All these specimens agree in form except that some are broader and have more segments than others: in all, the upper part of the leaf-lobes is tapering and entire.

Resin bodies were demonstrated in all (but only after maceration), and the cuticles are uniform apart from the slight variations noted above. As Seward points out, the specimen on his pl. ix. fig. 5, is very like Bunbury's type and the other leaves with it, but Seward's pl. ix. fig. 3, looks more like *B. canaliculata* than any of the present specimens of *B. gracilis*.

This loss of the cuticle on the exposed side is certainly due to exposure, since it is preserved where the leaf is still covered by rock, or even where smeared with a particle of mud at the time it was collected. The loss is shown equally by all the associated leaves, and is probably not caused by rubbing of the surface.

It is suspected that the destruction was caused by the prolonged action of gum or varnish with which the old museum specimens were coated. Some specimens are covered with a water soluble gum, some a varnish which has become brown but remains soluble in acetone, and some have both gum and varnish. It is suggested that an oily constituent of the covering has soaked into the cuticle, dispersing its molecules sufficiently to cause their destruction on maceration. The specimens with both cuticles well preserved are unvarnished, but against this suggestion must be set the fact that in the type-specimen, which has also lost the exposed cuticles, there is no visible varnish, but only a peculiar smell to suggest that it has been in any way treated.

*Variation.*—The numerous specimens show the usual variation in size and width of leaf and number of segments but the form of the individual segment is constant, and resin is always present. The cuticle is constant in the distribution of stomata and many other features, but the papillæ of the ordinary cells and of the subsidiary cells are varied.

The ordinary epidermal cells rarely possess a papilla at all, but in a few specimens feebly-developed median thickening are seen in certain cells of the lower epidermis, and Black describes a specimen in which the upper epidermal cells between the veins have papillæ. The subsidiary cells lack papillæ altogether in certain leaves and instead develop a continuous or broken rim of cuticle (fig. 6 A). In others, such as Bunbury's type-specimen, certain stomata have no papillæ, others have them irregularly

developed and others fairly regularly and strongly developed, pointing either horizontally over the aperture or vertically on the middle of the cells. I have examined a preparation from which Black made his "slide 65" and "fig. 9," which is precisely like Bunbury's type in its development of papillae, the subsidiary cells being varied but no ordinary cells of either epidermis having any.

The variation between the form figured here and the papillate form appears to be continuous and does not form a basis for the further division of *Baiera gracilis*; it would, however, be interesting to know whether the mean development of papillae varies at all with age and locality.

*Baiera canaliculata*, sp. n.

(Figs. 6 B, C, 7, 8.)

*Material*.—The type-specimen is a fragment of a well-preserved leaf collected by F. M. Wonnacott from the Gristhorpe Bed of Clayton Bay in 1938. The only other specimen belongs to the Bean Collection and is labelled "Inf. Oolite, Scarborough, Yorks." The matrix suggests that it, too, may be from the Gristhorpe Bed.

*Diagnosis*. Leaf with a slender petiole, lamina as a whole forming  $\frac{1}{4}$ — $\frac{1}{3}$  of a circle—deeply divided into 4–16 segments. Segments growing wider distally, apex obtuse, rounded or irregularly forked. Upper surface of lamina convex, margins more or less recurved; lamina traversed by 2–4 veins below, 4–6 veins above, veins inconspicuous. Resin absent.

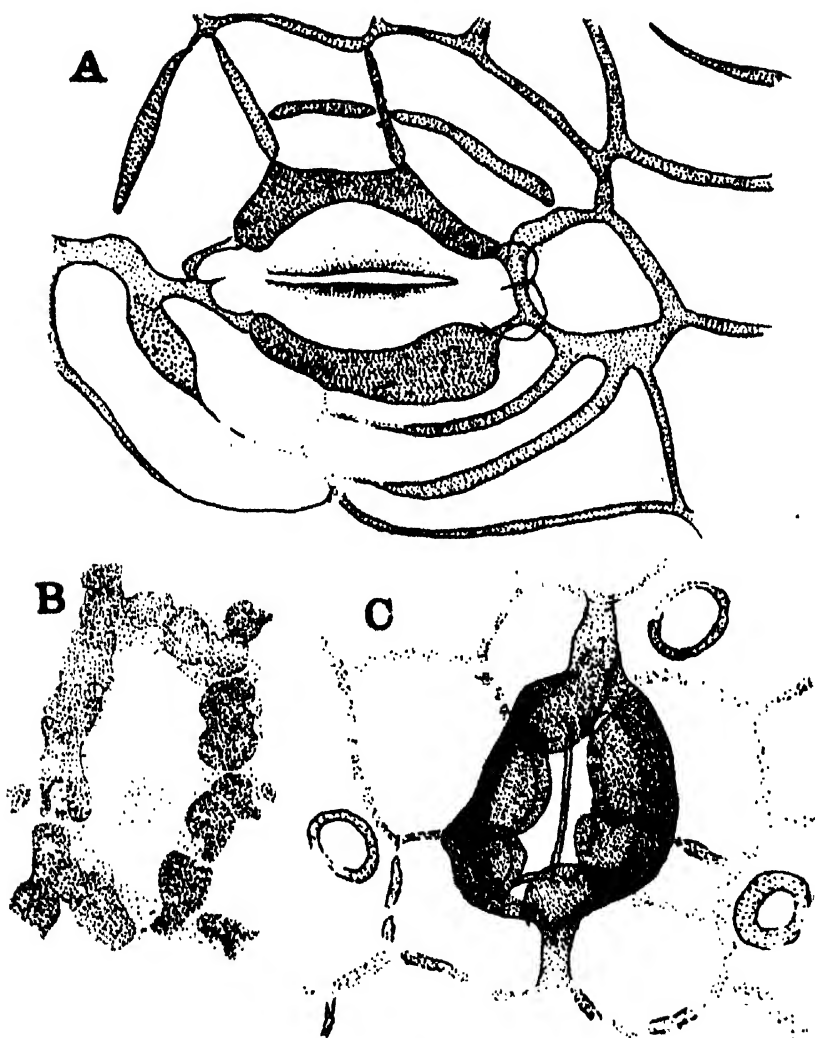
Cuticle moderately thick (about  $2.5\mu$  above,  $1.5\mu$  below). Stomata confined to strips between veins on lower side. Trichomes absent on both sides. Upper cuticle showing narrow cells along veins, almost isodiametric cells between veins. Cell-surface slightly bulging but median papillae scarcely developed or entirely absent, no characteristic surface-sculpture present. Cell-outlines broad and straight but not very conspicuous.

Lower cuticle showing elongated cells with strongly-marked lateral walls along the veins, isodiametric polygonal cells between the veins; vein-strips considerably broader than those of the upper side. Trichomes absent; stomata occurring at concentration of about 50 per sq. mm., confined to strips between veins. Epidermal cells between veins with a strongly convex surface but cell-



outlines indistinct, cuticle scarcely at all thickened along the anticlinal walls. Cell-surface often showing a somewhat thickened central region, and occasionally the centre

Fig. 6.

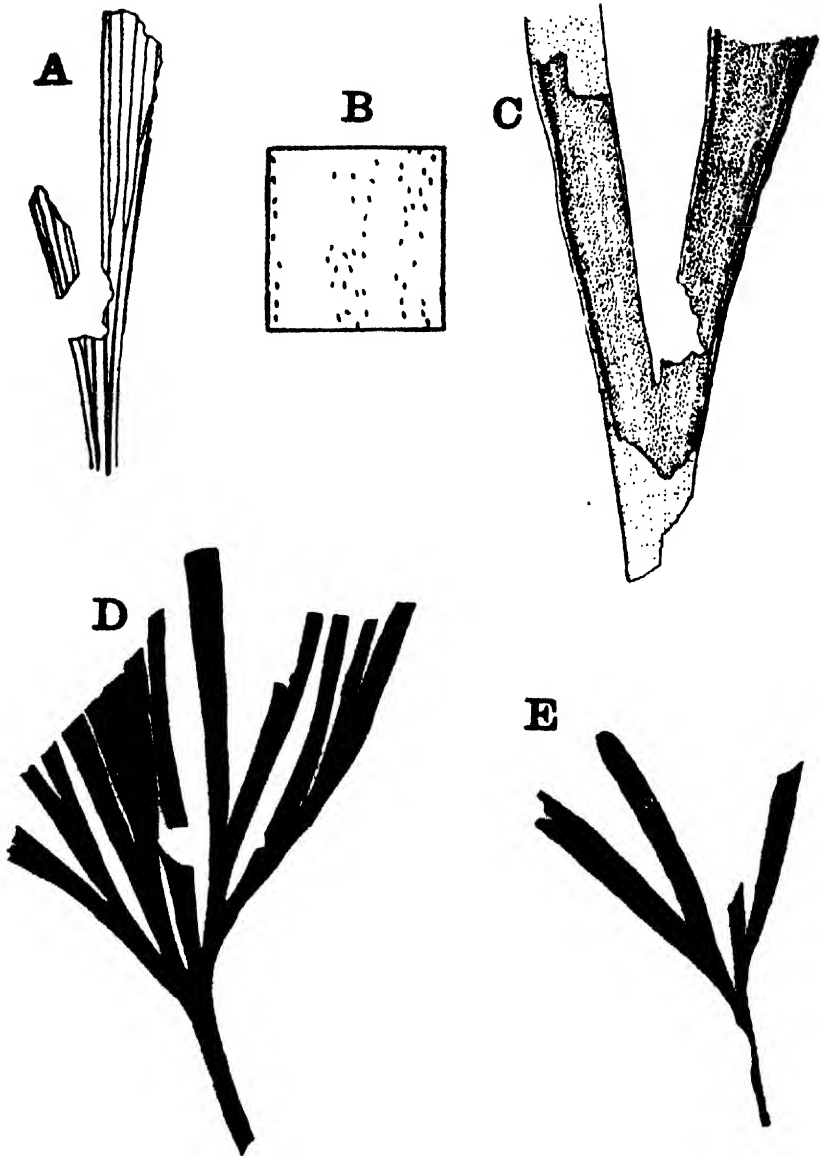


*Baiera gracilis* and *B. canaliculata*.

A, stoma of *B. gracilis*, non-papillate form, V. 6475, slide C,  $\times 800$ . B, cell of upper side of *B. canaliculata* to show the appearance of the walls, V. 25854,  $\times 800$ . C, *B. canaliculata*, typical stoma, V. 25854,  $\times 800$ .

of the cell is sufficiently raised to form a hollow papilla. Surface of cells obscurely mottled.

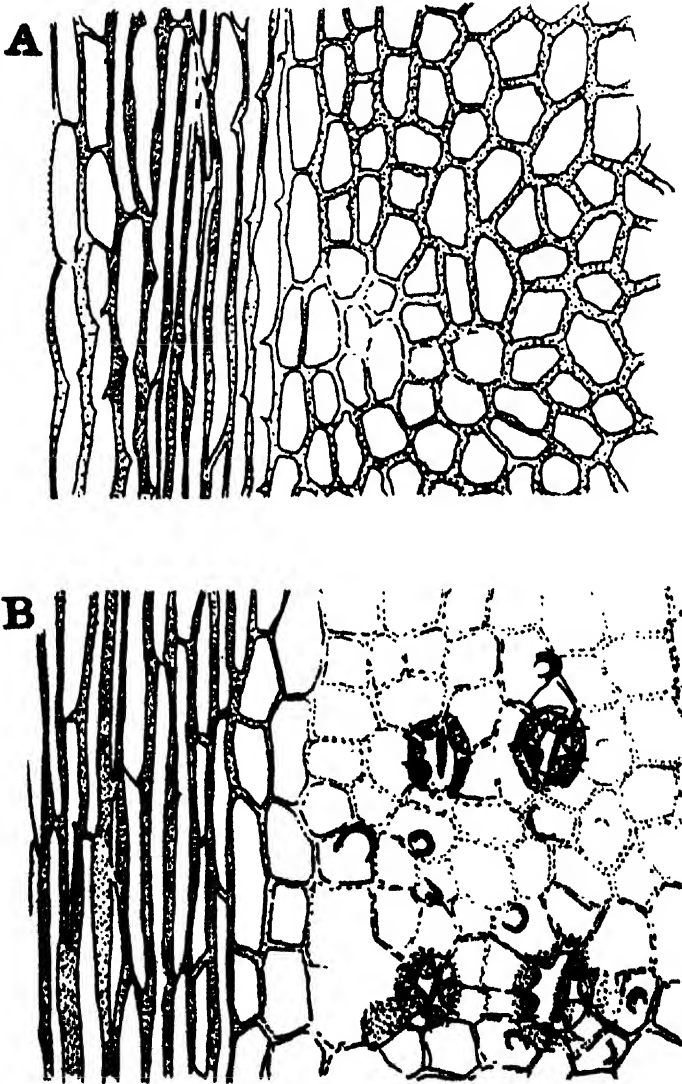
Fig. 7.

*Baiera canaliculata.*

- A, part of lamina by transmitted light to show the veins,  $\times 2$ . B, 1 sq. mm. of lower side showing apertures of stomata (short black lines). C, part of lamina by reflected light showing recurved margins (scarcely indicated at all where the substance has flaked off),  $\times 4$ . D, type-specimen drawn from part and counterpart, V. 25854,  $\times 1$ . E, small leaf, 39280,  $\times 1$ . A-D all represent the type-specimen.

Stomata mostly orientated longitudinally, irregularly scattered. Guard-cells sunken, often concealed by papillæ of subsidiary cells. Subsidiary cells forming an oval

Fig. 8.



*Baiera canaliculata.*

A, upper cuticle ; B, lower cuticle, both  $\times 200$ .  
In each a vein lies on the left, V, 25854, type-specimen.

stomatal pit, cuticle strongly thickened round sides of pit.  
Each subsidiary cell usually bearing a large papilla

pointed horizontally over the guard-cells : papillæ thickly cutinised, probably flattened in section but hollow. Outer margins of subsidiary cells not forming a definite ring : encircling cells absent.

*Discussion.*—The strongly recurved margins of the type-specimen (less recurved in the other) are an unusual feature in *Ginkgoites* and *Baiera*, but further material is needed before they can be regarded as a reliable distinguishing character—no such curvature is seen in *B. gracilis* (*sensu stricto*). The main characters distinguishing it at present are therefore (1) the absence of resin, (2) differences in cuticle (absence of stomata above and differences between ordinary epidermal cells of both sides).

The specimen figured by Seward, 1900, pl. ix. fig. 3, under the name *B. gracilis* forma *muensteriana*, appears to be rather like *B. canaliculata* and may prove to be identical. It is redrawn in Seward, 1919, text-fig. 651, where the margins look to be rolled.

Another species of the *B. gracilis* complex.

Although the information is not full enough to complete the diagnosis of the following leaves as a new species, there is no doubt that they are different from *B. gracilis* Bunb. (and from *B. canaliculata*). The specimens described by Oishi (1933) and by Yabe and Oishi (1933) as cf. *B. gracilis* agree with *B. gracilis* in form. The stomata are distributed as in *B. gracilis* but the upper cuticle differs in being thinner than the under (instead of thicker) ; and on both sides the ordinary epidermal cells have finely sinuous outlines (instead of straight) and have small well-defined median papillæ (seldom distinct in *B. gracilis*). Papillæ are specially well developed on the subsidiary cells. The presence of resin is not mentioned. Its age is approximately Lower Oolite.

I am grateful to Dr. Hamshaw Thomas, Dr. M. Black and Mr. R. Wagstaffe for the loan of specimens, in addition to those of the British Museum.

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# 15. *Stenopteris williamsonis* (Brongn.).

(Figs. 9, 10.)

1828. *Sphenopteris Williamsonis* Brongniart, p. 50.
1829. *Sphenopteris Williamsonis* Brongniart, p. 177, pl. xlx. figs. 6–8. (Good figures.)
1829. *Sphenopteris digitata* Phillips, p. 147, pl. viii. fig. 6.
1834. *Sphenopteris Williamsonis* Lindley and Hutton, pl. cxxxi. (Good figures.)
1836. *Hymenophyllites Williamsonis* Göppert, p. 259. (Name.)
1900. *Sphenopteris Williamsonis* Seward, p. 154, pl. xvii. figs. 1, 2. See Seward, 1900, p. 154, for further references.

*Introduction.*—*S. williamsonis* is an uncommon leaf in the Gristhorpe Bed, its only known locality. The present material is three blocks in the Yorkshire Museum, one of which is unlocalised but the other two labelled Gristhorpe The Gristhorpe Bed is of Middle Estuarine age.

I am indebted to Mr. R. Wagstaffe, Curator of the Yorkshire Museum, York, for lending me the specimens.

*Description.*—All the present specimens bear old labels identifying them as this species. The various leaf-fragments on two of the blocks are all typical in every detail of

form, and there is no reason to doubt their identity with those figured by Brongniart and others. The third, a single specimen preserved in a harder and less fossiliferous shale than most of the Gristhorpe bed, but labelled "Upper shale, Gristhorpe," is unique in having a forked rachis, and the leaf-segments are unusually slender. The secondary and finer branching and the venation are, however, typical. This specimen has a cuticle, but it has been damaged by varnish and I could only obtain minute fragments showing small, straight-walled cells. No other species is known with which it could be identified, and, although the evidence is incomplete, it is determined provisionally as *S. williamsonis*.

*Emended diagnosis*.—Leaf 5–15 cm. long; 2–3 times pinnate; rachis usually simple, rarely forked; slender; flanked by a narrow wing of lamina. Primary pinnae opposite or alternate or irregular, lowest pinnae short, and arising at nearly a right angle; those in middle of leaf longest and arising at a more acute angle. Primary pinnae pinnately divided, ultimate branches short, narrow, pointed. Lowest secondary branch (pinnule) on catadromic side (facing stem) specially large and situated at the base of the pinna or even on the main rachis below the origin of the pinna. Veins forking at a very acute angle, ultimate branches each with one vein. Leaf-substance originally thick.

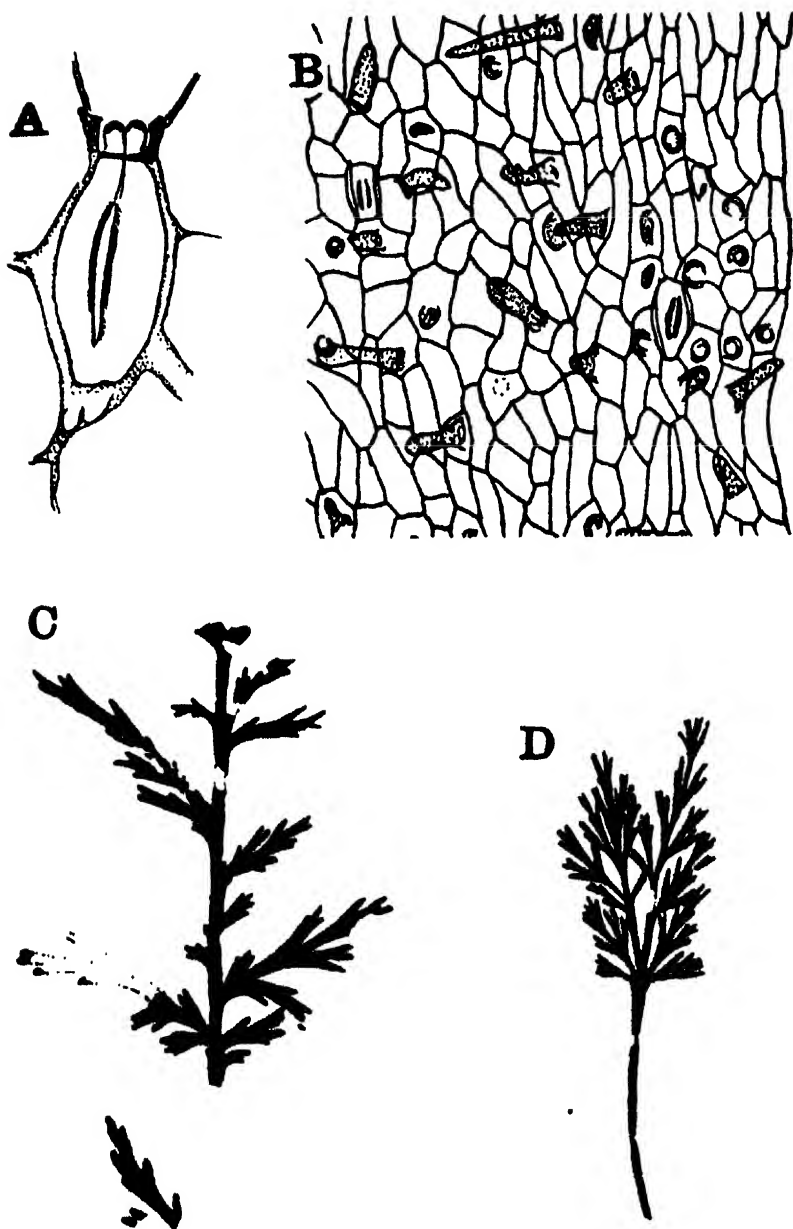
Cuticle of medium thickness ( $1.5\ \mu$ ) on both sides; tough and easily prepared. Cuticle on the two sides almost identically similar except that one may be slightly darker (thicker) and shows more strongly-marked cell-outlines. Stomata evenly scattered on both sides, very sparse, typically 13 per sq. mm.; stomatal index (*i. e.*

$$\frac{\text{No. of stomata}}{\text{No. of epidermal cells} + \text{stomata}} \times 100$$

extraordinarily low, about 0.7. Veins scarcely distinguished in the epidermis, except occasionally by the cells in the middle of a leaf-segment being narrower than near the sides.

Epidermal cells polygonal, often elongated. Cell-outlines straight, strongly marked, cell-surface finely and evenly mottled. ~ About a third of the epidermal cells on both sides bearing a single more or less median papilla. Papillae

Fig. 9.



*Stenopteris williamsonis.*

A, details of rather exposed stoma,  $\times 800$ . B, cuticle showing numerous hairs of various sizes,  $\times 200$ . C, middle part of normal-sized leaf,  $\times 1$ . This specimen provided the cuticles shown in A, B. D, small, forked leaf,  $\times 1$ .

very varied in development; largest consisting of a tapering tube of cuticle about  $60\mu$  long; medium sized ones a hollow but thick-walled hemisphere; less developed ones forming a barely perceptible bulge, papillae entirely absent on many cells. Cells bearing medium-sized or small papillae unspecialised, those with the largest sometimes unspecialised, sometimes small and oval and cut off from the end of another cell. Papillae probably stiff and pointing at right angles to the surface.

Stomata almost uniformly scattered, not forming rows but all orientated longitudinally. Guard cells almost flush with the surface, thinly cutinised except round the aperture. Exposed area oval, margins and poles overlapped by subsidiary cells. Subsidiary cells irregularly placed and like unspecialised epidermal cells, but papillae present on the majority. Papillae most commonly directed vertically as on other cells, but occasionally pointing inwards over the stomatal aperture. Unspecialised encircling cells occasional and irregular in distribution, often absent but occasionally forming an almost complete ring.

*Discussion.*—This leaf is transferred from the form-genus *Sphenopteris* to the more natural one *Stenopteris* because of the structure of its cuticle, which shows general agreement with those of certain other species, though that of the type, *S. desmourea* Saporta, is unknown. *Stenopteris* is one of several isolated Mesozoic leaf-genera believed to belong to the Pteridosperms (Thomas, 1933).

*S. williamsonis* is a typical *Stenopteris* in appearance, except that it is rather more finely branched than other N. Hemisphere kinds: the forked specimen figured here is of particular interest if rightly determined in that it resembles the S. Hemisphere species, e.g., *S. densifolia* (see Thomas, 1933), in its forked rachis. The S. Hemisphere species seem to be more delicately cutinised with less protected stomata than the Northern *S. dinosaurensis* (Harris, 1932, p. 75; 1935, p. 35; 1937, p. 36) and *S. astartensis* (Harris, 1932, p. 77), and here also *S. williamsonis* seems to be intermediate.

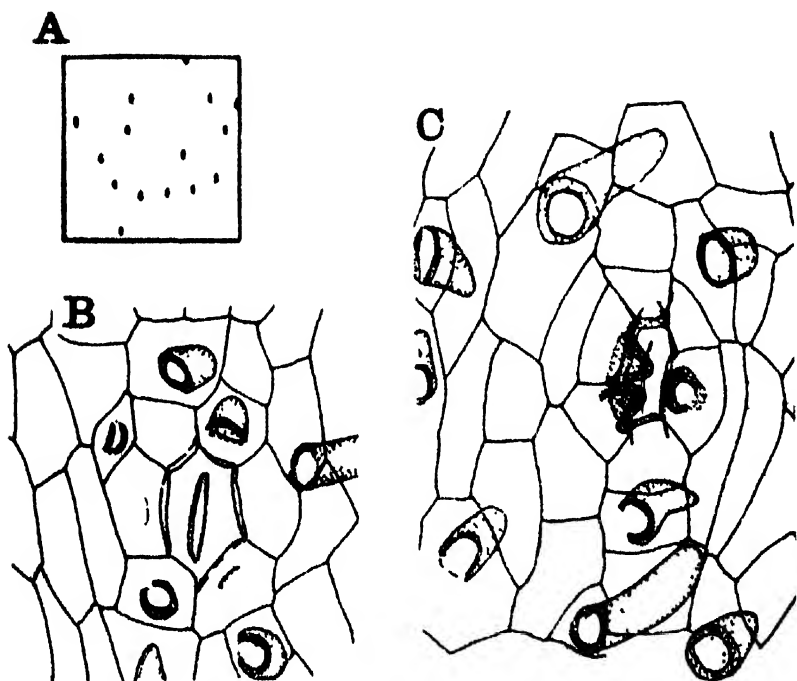
The inclusion of *S. williamsonis* in '*Hymenophyllites*,' by Göppert and others was based on the extreme delicacy of many specimens which consist of no more than a brown film of cuticle enclosing a darker vascular strand. This is no doubt the result of rotting in the early stages of preservation; the substance in the best specimens is fairly thick.



It is interesting to note that many fragments of this rare leaf are crowded over a bedding plane on one of the blocks. Evidently this species, like others at Gristhorpe, can be locally abundant.

The branching of the leaf would repay further study with better material. The lamina appears to be spread out horizontally as usual, but there is much still to be understood about the specimen shown in fig. 9 C. The irregular

Fig. 10



*Stenopteris williamsiana*.

Outline preparations from leaf shown in fig. 9 C. A, 1 sq. mm. of epidermis showing stomatal apertures (short black lines). B, moderately papillate stoma,  $\times 400$ . C, strongly papillate and protected stoma,  $\times 400$ .

alternation of long and short pinnæ is very likely explicable by the tendency of the secondary branch (pinnule) on the side facing the stem to arise prematurely from the main rachis; if so, this tendency is here carried far enough to give a very complex arrangement. More surprising is the attachment of the pinnæ to the rachis. Some pinnæ are purely lateral, others arise from the front, others from the

back. One seems to be subtended by a minute scale like a bract (possibly a premature "pinnule") and another crossed by a tiny fold of tissue. The preservation does not admit of full description of these features, but does show that there is something here calling for study.

It is noteworthy that Thomas (1933) found some similar features in the fructifications *Umkomaasia* and *Ptilophorosperma*, which he attributed to this or an allied leaf-genus. In discussing these fructifications Thomas raised far-reaching morphological implications by comparing the whole fossil both with a single "sporophyll" and with an "inflorescence" with branches arising in the axils of bracts, the two views being regarded as compatible. I suspect that this leaf might provide the key to this difficult problem.

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LIX.—*Three Races, one new, of the Serval (Leptailurus) from North Africa.* By R. I. Pocock, F.R.S., Zoological Dept., Natural History Museum.

EXAMINATION of the specimens of *Leptailurus* in the British Museum has revealed some interesting and previously unrecorded facts connected with the race inhabiting Algeria and with the two races found south of the Sahara, in Senegal, the Anglo-Egyptian Sudan and Abyssinia. The geographically isolated Algerian race, now apparently very rare in the country, does not seem hitherto to have been compared critically with those occurring further south in Africa nor to have been distinguished as a named subspecies. The eastward range of

the Senegal race into the Anglo-Egyptian Sudan has never been previously claimed, and changes have been made in its nomenclature. A new name has been given to the Abyssinian race, because neither of the two names under which it has hitherto been known is in my opinion admissible.

*Leptailurus serval constantina* Forster.

*Felis constantina* Forster, Buffon's Naturg. Vierfüß. Thiere, vi. p. 313, 1780, from Buffon, Suppl. Hist. Nat. iii. p. 231, 1776.

*Felis constantinensis*, Link, Beytr. Naturg. i. pt. 2, p. 91, 1795.

*Felis caracal*,  $\beta$  *algericus*, J. B. Fischer, Syn. Mamm. p. 210, 1829.

*Felis serval*, Levaillant, Expl. Sci. de l'Algérie, Mamm. pl. 2, 1866; Lataste, Act. Soc. Linn. Bord. xxxix. p. 104 (of separate copy), 1885; id., Expl. Sci. Tunisie, p. 15, 1887.

*Leptailurus serval constantina* Pocock, Proc. Zool. Soc. cxiv. p. 65, 1944\*.

Locality of the type of *constantina*, *constantinensis* and *algericus*, Constantine in Algeria.

*Distribution*.—Algeria and Tunis and possibly Morocco, but not yet recorded from that country.

A geographically isolated race characterized by its long, full coat and generally dull, dark colour, the upper side being pale brown with at most a slight buffish tinge but no bright hue, and the underside with comparatively little white; the pattern consists of bold stripes on the nape and shoulders, narrow but well-defined stripes on the back, and large well-spaced spots on the flanks and below, that of the limbs and tail being normal.

There are two skins in the British Museum. An adult ♂ from Oran, in western Algeria (Parzudacki, 44.9.2.13), with the coat very full and about 50 mm. long, has the upper side tolerably uniformly palish brown, with a faint buff cast and the lower side, at least on the belly, pale greyish tawny, passing into soiled white on the axillæ, posterior side of the fore legs, inner side of the thighs and inguinal region; the greater part of the throat is rather rich buff, but it is white in front, like the chin and upper lip; the pale band on the ears is normal in size, but buffish grey, not white, in colour; in the bold pattern the

\* As explained in this paper, Buffon's description, derived from Bruce, of the cat seen by the latter at Constantine, the description upon which Forster based the name *constantina*, applies neither to the typical wild cat, (*Felis lybica sarda*) of Algeria nor to any breed of domestic cat. Since Buffon's remarks about the pattern agree very closely with the pattern characteristic of the Serval, and since there is no other species of Felidae inhabiting Algeria to which the name can be assigned, I affix it to the Serval, which has long been known to inhabit that country. The names *constantinensis* and *algericus* were alike based on Buffon's description.

normal, partially interrupted stripes on the nape and shoulders are about 17 mm. at their widest part; there are two pairs of practically uninterrupted, thinner stripes running from the mid-back nearly to the tail, and the spots on the flanks, with a short diameter of about 17 mm., may be up to 40 mm. long but usually less.

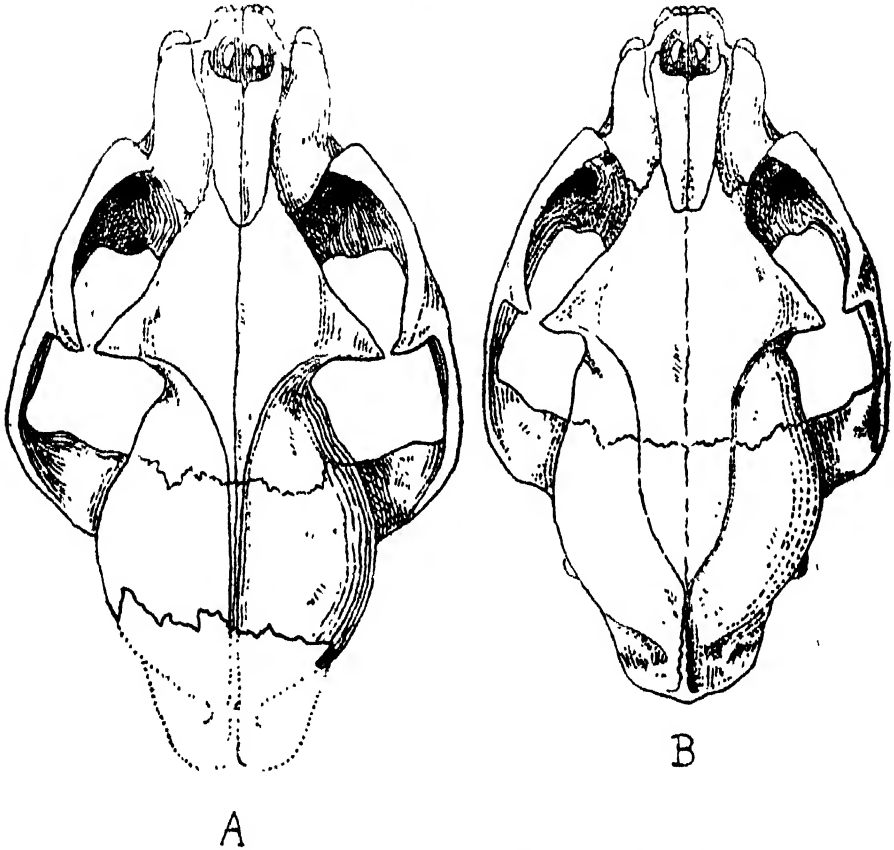
A second skin (E. C. Taylor, 1905.5.6.1), from Philippeville, in eastern Algeria, March, has the coat about as thick as in the preceding, but shorter, about 40 mm.; the general hue of the back and flanks is the same, but the outer sides of the thighs, shoulders and fore legs are brighter and more buffy, the fore legs especially being brightish ochreous and contrasting noticeably with the dull greyish-brown tint of these limbs in the Oran skin\*: there is a little more white on the lower side, especially on the fore throat, and the pale patch on the back of the ear is whiter but much smaller, extending only half-way across the ear from behind, the black area in front of it being much wider than usual. In no other Serval skin that I have seen is the white patch so reduced in size. The pattern, too, is not so bold as in the Oran skin, the outer stripes on the nape and the stripes on the shoulders being about 14 mm. wide, and the spots on the flanks have a short diameter of about 14 mm. and are only up to about 28 mm. in their long diameter.

The skulls of an adult ♂ and ♀ of approximately the same age are about the average size for the genus and differ from each other in the well-marked sexual features characteristic of most genera of the family. The ♂ skull (see figure A), belonging to the skin from Oran above described, has the occipital region broken away, but its condylobasal length, judging from the length of the mandible, which is 86 mm., and other data, may be estimated at 115 mm. or thereabouts. It is muscularly well moulded, with the zygomatic width, 86 mm., the post-orbital area compressed, 25 mm., about half the width of the cranium, which is 51 mm., and only a little wider than the interorbital area, which is 22 mm.; the post-orbital processes are expanded, their width from tip to tip being 54 mm., a little surpassing the width of the cranium; the temporal ridges are only 4 mm. apart at the suture and coalesce behind it. The teeth are rather

\* This skin was, formerly mounted, and was exhibited for several years in the gallery. Hence it is possible that the absence of bright colour in the limbs is due to fading.

small,  $m_1$ , being 14 mm. and  $m_2$ , 10 mm. long, and the upper canine has a basal antero-posterior thickness of 7 mm.

The ♀ skull, complete, but without skin (Lataste, 19.7.7. 1443), from Cap Aokas, Algeria, is shorter than the ♂ skull, its condylobasal length being 108 mm., and manifestly less



- A. Skull of adult ♂ of the Algerian Serval (*Leptasturus serval constantina*), from Oran, (Parzudacki, 46.3.17.17), showing the constricted postorbital area, the wide zygomatic arches and the proximity of the temporal ridges, due to muscular moulding, typical, with variations, of fully adult and old ♂ skulls of many species of Felidae. (The broken-away occipital area restored in dotted outline.) Two-thirds nat. size
- B. Skull of an adult ♀ of the same from Cape Aokas (Lataste 19.7.7.1443), showing the wide postorbital area, narrower zygomatics, and widely-spaced temporal ridges, due to weaker musculature, typical, with variations, of adult ♀ skulls of many species of Felidae. Two-thirds nat. size.

The sexual differences are exceptionally pronounced in these two skulls.

muscularly moulded, the zygomatics being much narrower, 77 mm., the postorbital area much wider, 34 mm., considerably more than half the cranial width, which is the

same as in the ♂, 51 mm., and greatly exceeding the inter-orbital area, which is 21 mm.; the postorbital processes are much less prominent owing to the less constricted postorbital area, their width from tip to tip being about the same as that of the cranium; the temporal ridges are 16 mm. apart at the suture and converge and meet on the posterior portion of the parietals, the sagittal crest behind them being 5 mm. high. The bulla is inflated, being 14 mm. high above the occiput, with a length and width of 25 and 16 mm. respectively. The teeth are a little smaller than in the ♂, *pm.*<sup>4</sup> and *m.*, being  $12\frac{1}{2}$  and 10 mm. respectively, and the upper canine 6 mm. thick at the base.

*Leptailurus serval tanzæ*, subsp. nov.

*Felis capensis hindei*, De Beaux, Atti Soc. Ital. Sci. Nat. p. 26, 1922 (not of Wroughton, Ann. & Mag. Nat. Hist. (8) v. p. 205, 1910).

*Felis capensis phillipsi*, Kershaw, Ann. & Mag. Nat. Hist. (9) xiii. p. 27, 1924 (not of G. M. Allen, Bull. Mus. Comp. Zool. lviii. p. 337, 1914).

*Felis (Leptailurus) serval phillipsi*, De Beaux, Atti Soc. Ital. Sci. Nat. lxiv. p. 211, 1925.

Locality of the type, Bahr dar Giorgis, Lake Tana, Abyssinia, 5500–5600 feet.

*Distribution*.—Abyssinia, Erythræa and North Somaliland.

Most nearly resembling and intergrading with the typical Serval of Kenya Colony, described by Wroughton as *hindei*, especially in its bold pattern of stripes on the nape and shoulders and large, well-spaced spots on the flanks; but distinguished on the average by the paler ground-colour of the flanks, which is more creamy and not so buff.

The type of this race, an adult, but not old, male, from Bahr dar Giorgis, west of Lake Tana (T. P. Mitchell, 23.3.26.7), June 5th, has the summer coat full and about 40 mm. long. The nape and shoulders are very pale buffish cream, the spinal area behind the shoulders dark buffish grey and rather sharply contrasted with the cream tint of the flanks, which blends with the white of the lower side; the outer sides of the thighs and shoulders are like the flanks, but the rest of the limbs are greyish white and the hind throat is creamy. The general colour is so pale that the skin looks almost white alongside normal buff-coloured skins. The pattern is strong, the outer nape-stripe on one side being about 160 mm. long and 20 mm. wide at the widest part; the shoulder-

stripes are equally well developed, one of them being 140 mm. long and 17 mm. wide ; on the middle of the back there are three small spinal stripes only to a slight extent interrupted ; the spots on the flanks are large, their diameters being up to 35 by 15 mm. in front and 25 by 12 mm. behind ; the pattern on the head, tail, limbs, throat and the rest of the lower side is rather unusually well developed.

A second adult, rather older, ♂, from the Lake Tana district (R. E. Cheesman, 37.2.24.27), is undated and has the coat about the same as in the type, but differs in having the head, nape, shoulders, spinal areas and outer side of the legs more richly tinted, buff instead of buffish cream ; the flanks too are not quite so pale, although contrasted with the spinal area ; the pattern also is not so bold, the outer nape-stripe being about 15 mm. wide at its widest and the shoulder-stripes narrower, about 10 mm. wide, but the longest about 154 mm. ; the spinal stripes are a little more discontinuous and the flank-spots are from about 35 to 25 mm. long and 20 mm. wide.

A third skin (P. L. Cox, 94.12.13.1), from North Somaliland, is an almost exact match of Cheesman's skin in colour but has the pattern bolder, almost as in the type apart from minute details.

The character of the pattern has been described in some detail in the two skins from Lake Tana to justify setting aside the opinion of Kershaw, who identified the type as *phillipsi*, but noted its paler colour, and of De Beaux, who, influenced apparently by Kershaw, assigned skins from Erythræa and from Gondar and Shoa in Abyssinia to G. M. Allen's race, stating that a skin from Shoa seemed to agree closely with Allen's description of *phillipsi*.

The type of *phillipsi*, an adult ♂ from El Garef, on the Blue Nile, was described by Allen as a rather pale skin, buff in colour above, with the normal stripes on the nape, of which the widest is only 10 mm., breaking up into spots on the hinder part of the nape, with the normal shoulder-stripes also broken up into elongated spots, of which the largest is 50 mm. long and 10 mm. wide, and with the body behind the shoulders uniformly spotted, without any semblance of stripes, the spots being from 10 to 15 mm. in diameter. From this it is clear that the pattern is not only much finer, but much more disrupted, than in the two skins from Lake Tana ; but no doubt the two races intergrade.

From its locality and low lying habitat it may be reasonably inferred that *phillipsi* is more akin to the Serval of other districts of the Egyptian Sudan than to the one inhabiting the Lake Tana district of Abyssinia. The British Museum has three skins of the Sudauese type. One from the White Nile (Parzudacki, 59.6.19.1) has the coat thin and short, only 24 mm. long, and is pale buff above; the nape and shoulder-stripes are normal in continuity but narrow, about 8 and 10 mm. wide respectively; the three spinal stripes are complete and the flank-spots are elongated, being from about 20 to 25 mm. long and about 8 mm. wide. A second skin, from Khartoum (S. S. Flower, 5.10.5.8), has the coat as in the last but is brighter buff, its pattern is very nearly the same, although the flank-spots are a little shorter. These two skins differ from the type of *phillipsi* in the comparative completeness of the stripes on the shoulders and spine; but they are indistinguishable from the Senegal race, *brachyura*\*, which on this evidence extends right across the Southern Sahara. The third skin (D. L. Baxter and S. S. Flower, 21.4.18.1), from El Obeid in Southern Kordofan, is richer buff than the preceding two, and in the disruption of its dorsal pattern agrees closely with Allen's description of *phillipsi*, the normal stripes on the shoulders and spine being broken up into a number of spots, there being no stripes behind the shoulders. There is very little doubt that this is only a variation of the pattern exhibited by the skins from the White Nile and Khartoum. Hence it follows that *phillipsi*, if admitted as a race, can only be regarded as an extreme eastern form of the typical West African *L. s. brachyura*, the type of which was shipped from Sierra Leone.

It may be noted that the coat of the skin from El Obeid is only 32 mm. in mid-winter, December 29th,

\* This name, the oldest of the five given to the Serval of Senegal, Sierra Leone and adjoining districts of West Africa, was proposed by Wagner in 1841 as a substitute for the preoccupied name *servalina*, applied by Ogilby in 1839 to the skin of a Serval from Sierra Leone, which differed strikingly from the normal type in the disintegration and partial evanescence of the pattern. The two styles of pattern, with variations, are found practically all over Africa south of the Sahara, frequently in the same locality. Although as lately as 1924 they were mostly regarded as of specific significance, I asserted in 1917 (*Ann. & Mag. Nat. Hist.* (8) xx. p. 337) that there is but one species of Serval, the so-called "servaline cats" being merely pattern-phases or mutants of the normal type. Since that date considerably more evidence in confirmation of that conclusion has come to hand.



noticeably shorter and thinner than the midsummer skin of the type of *tanæ*.

There is also some evidence that the skull of *tanæ* is a little longer than in *phillipsi*. According to Allen, the basal length of the skull of the type of the latter, an adult ♂, was 102 mm., which would make the condylobasal length 110 mm. In the type of *tanæ*, also an adult ♂, those dimensions are respectively 106 and 114 mm., whereas in the older skull of Cheesman's specimen they are 109 and 117 mm., their total lengths being 122 and 127 mm. respectively. The only adult skull measured by De Beaux, one from Erythræa, had a basal length of 99 and a condylobasal length of 105½ mm., but he gave its total length as 126 mm. This must have been a misprint for 116, since in no Serval does the total length exceed the condylobasal length by as much as 19 or 20 mm. No doubt his Erythræan skull was that of a ♀.

The skulls of my specimens from the White Nile, Khartoum and El Obeid are immature, and there are no adult ♂ skulls of typical *brachyura* available. But the condylobasal length in five ♀ skulls from Sierra Leone and Senegal ranges from 102 to 108 mm., the average being 105 mm., which is quite in keeping with the view that *phillipsi*, with a ♂ condylobasal length of 110 mm., represents the same race.

As stated above under the diagnosis, the three skins I assign to this new local race closely resemble the Serval of Kenya Colony, quoted as *hindei*, the pattern being practically the same but the ground-colour of the flanks paler on the average. It is noticeably paler than in the type and a topotype of *hindei* from Machakos, which are buff all over the upper side; but an adult skin from Solai, Mt. Kenya, 8000 ft (R. Kemp, 11.4.7.15), December, is exceptionally pale, hardly differing from Cheesman's skin from Lake Tana. Still paler, and closely matching the type of *tanæ* from Bahr dar (Giorgis, Lake Tana, is a skin from Arusha in the Kilimanjaro district (S. P. Teare, 35.3.14.6). These are two items of evidence of intergradation between the Abyssinian and the Kenya Servals. A third is supplied by a skin from Ogo, British Somaliland (R. E. Drake-Brockman, 34.9.14.17), which in pattern and colour is indistinguishable from the prevalent Kenya form.

There is no convincing evidence that the skulls of the Abyssinian Servals differ from those of Kenya Colony. The available material merely suggests that the former

may possibly be a trifle larger on the average. The condylobasal lengths in the two ♂ skulls from Lake Tana are 114 and 117 mm., the average being  $115\frac{1}{2}$ , whereas adult ♂ skulls from Kenya vary from 111 to 116 mm., the average of six being  $113\frac{1}{2}$ . The fragmentary skull belonging to the skin from North Somaliland is represented only by its facial portion. It is obviously that of an adult ♂, and its details agree very closely with those of the type of *tanzæ*.

**LX.**—*New Species of South American Chrysomelidæ* (Halticinæ, Col.) By G. E. BRYANT, F.R.E.S., Imperial Institute of Entomology.

ALL the types of the following new species are in the British Museum (Natural History).

*Systema fryi*, sp. n. (Fig. 1.)

Flavous, the prothorax with large round punctures and a median longitudinal fuscous stripe, the elytra strongly punctate-striate and carinate between the striæ, a short fuscous marking between the shoulders and suture, the suture narrowly fuscous, and a curved fuscous marking just behind the middle.

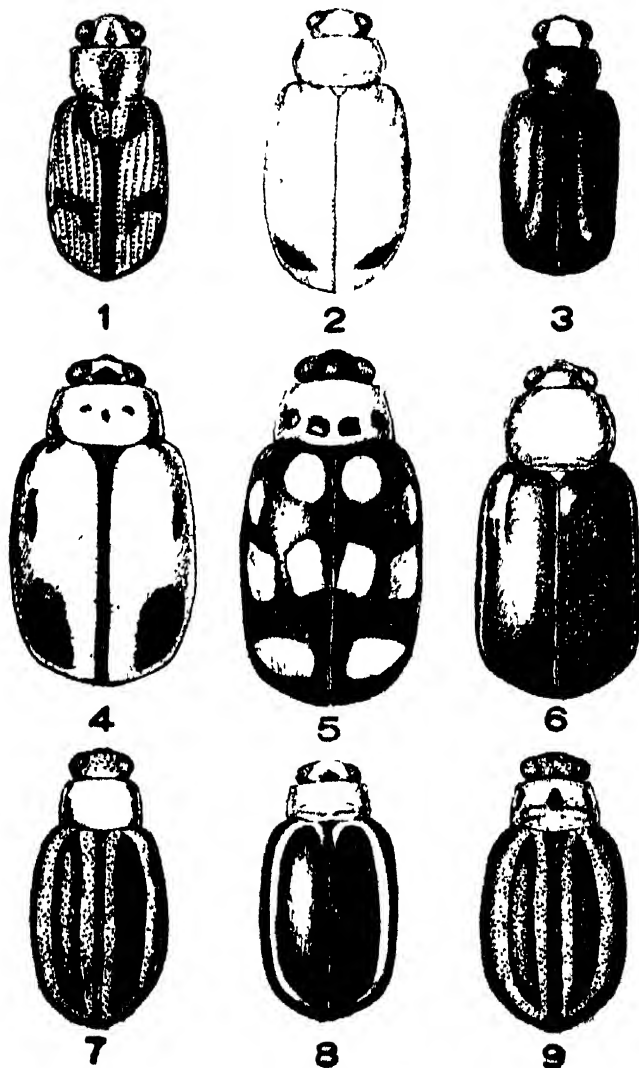
Length 3 mm.

Head flavous, with a short median fuscous longitudinal marking at the base, a few large scattered punctures, and the eyes rather prominent. Antennæ flavous, extending beyond the base of the elytra, the first segment the longest, twice as long as the second, the remaining segments slightly pubescent. Prothorax flavous, with a median longitudinal narrow fuscous stripe, transverse, the sides slightly contracted to the base, the punctures large and close, clothed with fine short pubescence. Scutellum triangular, fuscous, impunctate. Elytra elongate, the sides rounded to the apex, flavous, with fuscous markings, one short longitudinal fuscous marking between the shoulder and suture curving in towards the suture, the suture narrowly margined with fuscous, and a fuscous semicircular marking just behind the middle, very strongly punctate-striate and carinate between the striæ. Legs flavous. Underside with the ventral segments of the abdomen flavous and all about equal.

**BRAZIL:** Rio de Janeiro (*Alexander Fry*), 3 specimens.

Allied in size and colour to *S. c-nigrum* Jac., from Paraguay, but the puncturation and sculpture quite different, and *S. c-nigrum* is very nitid.

Figs. 1-9.



- |   |  |
|---|--|
| 1. <i>Systena fryi</i> , sp. n.             | 5. <i>Disonycha argentina</i> , sp. n.   |
| 2. <i>Systena amazonica</i> , sp. n.        | 6. <i>Cæporis cæruleipennis</i> , sp. n. |
| 3. <i>Systena fulvifrons</i> , sp. n.       | 7. <i>Pelonia nigrolineata</i> , sp. n.  |
| 4. <i>Disonycha nigrosuturalis</i> , sp. n. | 8. <i>Pelonia circumdata</i> , sp. n.    |
|   | <i>Pelonia boliviana</i> , sp. n.        |

*Systena amazonica*, sp. n. (Fig. 2.)

Entirely flavous, except for a large fuscous spot near the apex of each elytron, the prothorax impunctate, the elytra strongly and closely punctured.

Length 6 mm.

Head flavous, a few fine scattered punctures, a short longitudinal impression just behind the insertion of the antennæ, the clypeus slightly paler, eyes somewhat prominent. Antennæ flavous, pubescent, the five basal segments tinged with fuscous, the apical ones paler, the first segment the longest, the second short and rounded, the third and fourth equal to each other, and each twice as long as the second, the fifth to the apical segment each about equal, and each slightly shorter than the fourth. Prothorax flavous, nitid, transverse, the sides rounded, widest about the middle, a transverse impression in front of the basal margin. Elytra flavous, with a large fuscous spot near the apex of each elytron and nearer the side-margin than the suture, strongly and closely punctured, the shoulders rounded and wider than the base of the prothorax. Legs and underside flavous.

BRAZIL; Amazon, Degand (*Fry Collection*), 3 specimens.

Somewhat allied to *S. antennata* Jac., from the Amazon. but differs in colour and structure of the antennæ.

*Systema fulvifrons*, sp. n. (Fig. 3.)

Shining black, the head fulvous, the antennæ flavous, prothorax with the basal margin tinged with fulvous, finely punctured, elytra finely and closely punctured, with a faint fulvous stripe parallel with the suture, turning outwards at the apex.

Length 6 mm.

Head entirely fulvous, nitid, with a few scattered punctures, the palpi flavous. Antennæ flavous, long and slender, extending beyond the base of the elytra, the first segment the longest, the second more rounded and about half as long, the third more slender, about a third longer than the second, and the remainder each about equal to the third. Prothorax subquadrate, the sides slightly contracted to the base and narrowly margined, black, nitid, with the basal portion transversely impressed and narrowly fulvous, finely and not closely punctured. Elytra elongate, the sides parallel, rounded at the apex, finely and closely punctured, shining black, with a faint narrow fulvous stripe parallel to the suture, expanding outwards at the apex. Legs black or tinged with fulvous, the ventral segment margined with fulvous, and clothed with fine short pubescence.

EQUADOR: Paramba, 3,500 ft., iv. 1897 (*Rosenberg*), 3 specimens; Rio Pescado, 1,500 ft., 17. v. 1922 (*G. H. Tate*), 2 specimens.

Allied to *S. frontalis*, F., from N. America, but smaller and more nitid, and the puncturation not nearly so rugose.

*Disonycha nigrosuturalis*, sp. n. (Fig. 4.)

Flavous, a black spot at the base of the head, prothorax with three small fuscous spots across the middle, elytra with the suture narrowly black, and each with three black patches.

Length 5 mm.

♂♀.—Head flavous, with a black patch at the base, rugose, and a few large punctures near the inner margin of the eyes. Antennæ extending beyond the base of the elytra, the four basal segments flavous, the remainder fuscous, the first segment about as long as the second and third together, flavous, with the upper side fuscous, the fifth to the eleventh each about equal, clothed with fine short grey pubescence. Prothorax transverse, the sides narrowly margined, the anterior angle slightly produced, flavous, with three small fuscous spots across the middle, closely and finely punctured. Scutellum black, nitid, triangular. Elytra elongate, with the sides narrowly margined and rounded at the apex, flavous, with the suture narrowly black, a small black patch inside the shoulder at the base, another elongate patch near the side-margin before the middle, and a longer more or less rounded patch near the apex, the surface finely punctured. Legs flavous, the hind femora with the apical half fuscous. Underside flavous. Male with the first segment of the anterior tarsi strongly dilated.

ARGENTINE: Santa Fe, Estancia la Noria, Rio San Javier, 11. xii. 1911 (*G. E. Bryant*), 2 specimens.

Allied to *D. suturalis*, Bry., from the Argentine, but smaller, less nitid, and differently marked.

*Disonycha argentina*, sp. n. (Fig. 5.)

Above the head black, with two flavous spots, prothorax flavous, with four fuscous spots, elytra black, with ten flavous spots, the underside flavous, antennæ and legs more or less fuscous.

Length 5 mm.

♂♀.—Head black, nitid, a flavous spot near the inner margin of each eye, impunctate. Antennæ extending to the middle of the elytra, the ten basal segments fuscous, tinged with fulvous, the eleventh segment entirely fulvous, the first segment more dilated and twice as long as the second. Prothorax transverse, the sides strongly margined and the anterior angles oblique, flavous, with four fuscous spots in a transverse line near the base, very finely and not closely punctured. Scutellum black, nitid, triangular. Elytra with the sides feebly margined and rounded at the apex, black, nitid, finely and closely punctured, each with five flavous spots, two at the base, two at the middle, and one at the apex. Legs fuscous, with the base of the femora and tibiae fulvous. Underside flavous. Male with the first segment of the anterior tarsi more dilated.

ARGENTINE: Santa Elena, Entre Rios, i. 1912 (G. E. Bryant), 6 specimens.

PARAGUAY: San Bernardino, 1905 (K. Fiebrig), 2 specimens.

Closely allied to *D. austriacus*, Shauf., from Brazil, but differs in having two basal spots on the elytra instead of one, and two median instead of a transverse band, also differs in having spots on the prothorax.

(*Cæporis cæruleipennis*, sp. n. (Fig. 6.)

Elongate, the head and prothorax flavous, the elytra metallic blue, the legs more or less fuscous, underside flavous.

Length 5-5.50 mm.

♂♀.—Head flavous, impunctate, transversely impressed between the eyes. Antennæ extending to the middle of the elytra, the three basal segments flavous, with the apical portion tinged with fuscous, the eight terminal segments fuscous, the first segment the longest and more dilated towards the apex, twice as long as the second, the third to the tenth all about equal, and the eleventh slightly longer, more slender and acuminate. Prothorax flavous, slightly transverse, the sides slightly rounded and narrowly margined, a feeble transverse impression along the basal margin, impunctate and nitid. Scutellum flavous, triangular, impunctate. Elytra bright metallic blue, finely and irregularly punctured, the sides almost straight, rounded at the apex, and narrowly margined. Legs with the tibiae fuscous, the anterior and middle femora flavous, with the apical portion fuscous, the posterior femora with

the basal half flavous, the rest fuscous, the tarsi more or less fulvous, the male with the first segment of the anterior tarsi more dilated. Underside flavous.

ARGENTINE : Estancia la Noria, Santa Fe, 11. xii. 1911 (*G. E. Bryant*), 4 specimens.

Differs from previously-described species in its bright metallic colour.

*Pelonia nigrolineata*, sp. n. (Fig. 7.)

Flavous, the elytra narrowly margined with black, a broad black longitudinal line on each, the suture narrowly black, the head with large shallow punctures, the elytra with very fine irregular punctures.

Length 4 mm.

Head flavous, the vertex rugose, with large shallow punctures, the basal portion with fewer punctures. Antennæ long and slender, extending to the middle of the elytra, the three basal segments flavous, the remainder black, the first segment the longest, equal to the second and third together. Prothorax flavous, very transverse, the sides narrowly margined and slightly contracted in front, opaque and very minutely punctured. Scutellum black, the apex rounded. Elytra opaque, not shining, flavous, with a median longitudinal broad black line, the side-margins and suture narrowly black, very finely and not closely punctured. Legs flavous, the tibiæ and tarsi slightly darker than the femora. Underside with the ventral segments of the abdomen fuscous.

BRITISH WEST INDIES : Trinidad, i. 1903 (*G. E. Bryant*), 1 specimen (*Holotype*).

BRAZIL : Para, 1 specimen.

Allied to *P. vittata*, Clk., from Para, but smaller, and the colour differs in the black markings being not so heavy and the prothorax flavous, not red.

*Pelonia circumdata*, sp. n. (Fig. 8.)

Head and prothorax flavous, the elytra black, with a narrow flavous stripe inside the side-margins curving in at the apex, and curving down near the scutellum.

Length 3.5 mm.

Head flavous, with a median fuscous spot at the base, strongly punctured, the labrum fuscous. Antennæ long and slender, extending to the middle of the elytra, the three basal segments flavous, the eight terminal segments black and more pubescent, the first segment about equal to the

second and third together. Prothorax flavous, transverse, feebly punctured, the sides narrowly margined, a transverse impression near the base. Scutellum black, impunctate. Elytra oblong, the sides parallel and rounded at the apex, very finely punctured, black, with a narrow flavous stripe parallel with the side-margin, incurved at the apex and at the base near the scutellum. Legs flavous, the posterior femora with the apical portion fuscous. Underside with the ventral segments of the abdomen fuscous.

BRAZIL: Amazons (*H. H. Smith*), 1 specimen.

Allied to *P. nigrolineata* Bry., but differs in its more elongate form, pattern, and slightly more nitid appearance,

*Pelonia boliviana*, sp. n. (Fig. 9.)

Fulvous, the antennæ with the eight terminal segments fuscous, head with a black spot at the base, prothorax with three small black spots, elytra with the suture and margins narrowly black, and a longitudinal black stripe on each, legs with the tibiæ and tarsi fulvous.

Length 4 mm.

Head fulvous, with a small black median spot on the base, rugosely punctured, with a longitudinal median carina on the basal half. Antennæ long and slender, extending to the middle of the elytra, the three basal segments fulvous, the remainder fuscous, the first segment longer than the second and third together, the fourth segment nearly twice as long as the third, and slightly longer than the fifth, the fifth to the eleventh all about equal. Prothorax transverse, fulvous, with a median black spot, and one near each side-margin; the sides contracted in front, narrowly margined, rugosely punctured, a median rounded impression and a transverse basal impression. Scutellum black, impunctate. Elytra fulvous, the suture and side-margins narrowly black; and each with a longitudinal broad black stripe, not extending to the base or apex, strongly and closely punctured. Legs with the femora fulvous, the posterior pair with the apical portion fuscous, the tibiæ and tarsi fuscous. Underside fulvous.

BOLIVIA: (*Jacoby Collection*, British Museum), 4 specimens.

Allied to *P. nigrolineata* Bry., but differs in its much more rugose appearance, and in the black markings on the head and prothorax.



# THE ANNALS AND MAGAZINE OF NATURAL HISTORY.

[ELEVENTH SERIES.]

No. 83. NOVEMBER 1944.

LXI. *New Species of South African Staphylinidae (Col.).*  
By MALCOLM CAMERON. M.B., R.N., F.R.E.S.

*Phlaeonomus (Xylostiba) capensis*, sp. n.

Subconvex, shining black, the elytra dark reddish brown. Antennæ with the first five segments reddish yellow, the following reddish. Legs reddish yellow. Length 2·3 mm.

Smaller than *monilicornis* Gyll., the antennæ not so stout, the sculpture different. Head narrower than thorax (3·3 : 4·5), the front without sculpture, behind with some rather close, moderately fine punctures and wavy ground-sculpture. Antennæ with the 3rd segment as long as the 2nd, 4th and 5th moniliform, the following transverse, about a half broader than long. Thorax transverse (4·5 : 3), convex, the sides rounded in front, nearly straight and retracted behind, the posterior angles obtusely rounded, without impressions, moderately finely and moderately closely punctured and with vermicular ground-sculpture. Elytra almost twice as long as the thorax, closely and more coarsely punctured, the punctures more or less longitudinally confluent : ground-sculpture absent. Abdomen coriaceous, very obsoletely punctured.

S. Africa : Muizenberg. Under seaweed. Type in my collection.

*Trogophilæus* (s. str.) *minimus*, sp. n.

Rather shining, black. Antennæ black, the 1st segment reddish. Palpi pitchy. Legs pitchy, the tarsi yellow. Length 3.5 mm.

Build, colour and lustre of *memnonius* Er., but with dark legs, smaller eyes, much more distinctly punctured head and thorax, this broader, less finely, more deeply punctured elytra, much more closely pubescent abdomen, from *rufitarsis* Fauv. it differs in the larger eyes, distinctly punctured head, more deeply punctured thorax without ground-sculpture, the puncturation of the elytra scarcely differs in the two species, but the abdomen is more closely pubescent. Head distinctly narrower than the thorax, the post-ocular region short, briefly rounded, about a third as long as the curvature of the eye; front bi-impressed, the vertex with very small fovea, very finely and closely punctured. Antennæ rather long, the 4th segment a little longer than broad, 5th longer than the 4th, 6th and 7th slightly longer than broad, 8th to 10th slightly transverse. Thorax transverse (2.5 : 1.75), the sides rounded and strongly dilated in front, strongly retracted behind, the disc with four well-marked impressions, finely and closely punctured. Elytra longer (2.5 : 1.75) and broader than the thorax, as long as broad, with very similar puncturation, finely pubescent. Abdomen coriaceous, closely and finely grey pubescent.

S. Africa: Simon's Town. Unique. My collection.

*Oxytelus* (*Anotylus*) *capensis*, sp. n.

Shining, black, the elytra brownish red. Antennæ reddish, the 2nd and 3rd segments and legs reddish yellow. Length 2.3 mm.

Near *fulgidus* Fauv., of similar colour and lustre but smaller and narrower, the antennæ much thinner, thorax less transverse and without lateral impression, elytra longer, more closely punctured. Head transverse, subquadrate, narrower than the thorax, the eye as long as the rounded post-ocular region, the clypeus without sculpture, separated by a fine curved line from the rest of the head, the anterior border truncate; punctures very like those of *fulgidus*, not very close and varying a little in size. Antennæ with the 3rd segment shorter than 2nd, 4th to 10th transverse, the penultimate about

twice as broad as long, the 11th longer than the 9th and 10th together. Thorax transverse ( $2:1.75$ ), the sulci much as in *fulgidus*, finely and rather closely punctured, the punctures much more numerous than in that species. Elytra broader and a little longer than the thorax ( $2:1.75$ ), slightly transverse, towards the side with a well-marked stria and another less distinct on the disc, the punctures small, scanty and varying in size. Abdomen coriaceous, with a few small scattered punctures. The fore-parts without ground-sculpture.

S. Africa: Simon's Town. Unique. My collection

*Bledius (Hesperophilus) marginalis*, sp. n.

Black, the elytra with a large yellow marking extending from near the humeral angle to the middle of the posterior margin: the head dull, the clypeus more shining, the thorax dull for about the anterior half, more shining behind; the elytra and abdomen shining. Antennæ black, the 2nd and 3rd segments yellowish. Legs reddish yellow, the femora infusate. Length 3.5 mm.

Very near *lateripennis* Bernh., the colour-pattern similar, but a little larger, the antennæ a little longer and differently coloured, the thorax less closely and more superficially punctured, more strongly coriaceous and duller in the anterior half, the elytra less finely punctured. Head strongly coriaceous, the clypeus moderately shining. Antennæ with the 3rd segment a little shorter than the 2nd, 4th distinctly longer than broad, 5th about as long as broad, 6th to 10th gradually more transverse. Thorax transverse ( $2.5:2.2$ ), the sides straight and parallel for the anterior two-thirds, then obliquely retracted to the base, the posterior angles rounded, along the middle with a fine impressed line, rather finely, moderately closely, superficially punctured. Elytra longer than the thorax ( $3:2.2$ ), as long as broad, moderately finely rather closely punctured and without ground-sculpture. Abdomen finely coriaceous, finely and very sparingly punctured.

S. Africa: Simon's Town. Type in my collection.

*Bledius (Hesperophilus) niger*, sp. n.

Black, the head and anterior third of the thorax dull, the rest shining. Antennæ with the 1st segment pitchy,

2nd and 3rd brownish yellow, 4th to 7th blackish, the following obscurely reddish. Femora pitchy, tibiae and tarsi reddish yellow. Length 3 mm.

In build, lustre and antennæ structure resembling *marginalis* Cam., but a little smaller and narrower and at once distinguished by the entirely black and shorter elytra (2.5 : 2), coarser and deeper puncturation of the thorax, with the dull area less extensive, in other respects similar to *marginalis*.

S. Africa : Simon's Town. Type in my collection.

*Bledius (Hesperophilus) capensis*, sp. n.

Black, the fore-parts dull, the abdomen shining, the elytra with the posterior border broadly and the postero-external region almost to the middle of the lateral margin yellowish white. Antennæ reddish yellow, the first segment infusate. Legs reddish yellow, the femora infusate. Length 3 mm.

Build of *pruinosulus* Bernh., and with very similar short, white close pubescence. Head with the clypeus separated behind by a fine impressed line, the whole surface strongly coriaceous and impunctate. Antennæ rather short, the 3rd segment much-shorter than the 2nd, 4th and 5th about as long as broad, 6th to 10th transverse, gradually increasing in width. Thorax transverse (2.5 : 2), the sides gently rounded and coarctate with the base, the anterior angles slightly prominent, along the middle with a scarcely perceptible impressed line, strongly coriaceous, the puncturation rather close but very obsolete. Elytra longer than thorax (3 : 2), a little longer than broad, densely coriaceous. Abdomen rather shining, finely and rather closely punctured, with moderately long white pubescence and with yet longer yellow hairs along the posterior margins of the segments. Pubescence of the fore-parts short, fine and close.

S. Africa : Simon's Town. On the banks of a stream. Unique. In my collection.

*Bledius (Pucerus) capicola*, sp. n.

Black, head dull, the rest moderately shining, the elytra with the postero-external region from the apex of the suture to the middle of the lateral border, yellow. Antennæ with the first two segments reddish yellow, the

rest blackish. Legs reddish yellow, the femora infusate. Length 2.75 mm.

Much like *husseni* Qued. in build, but larger and in all other respects different. Clypeus separated by a fine shining line from the rest of the surface, the little tubercles further apart from one another than from the lateral margin, the whole surface strongly coriaceous. Antennæ with the 3rd segment shorter than the 2nd, 4th slightly longer than broad, 5th to 10th transverse, the penultimate twice as broad as long. Thorax slightly transverse (2.4 : 2), the sides straight and parallel, the posterior angles scarcely indicated, along the middle with fine impressed line, coriaceous, a little shining and with moderately close superficial punctures. Elytra longer than the thorax (3 : 2), longer than broad with moderately large, close but superficial punctures and without ground-sculpture. Abdomen more shining, coriaceous, practically impunctate.

S. Africa : Simon's Town. Unique. In my collection.

*Stenus (Nestus) nigerrimus*, sp. n.

Shining, black. Antennæ with 3rd to 8th segments dark brown, the rest black. Palpi with the 1st segment and base of 2nd yellowish, the rest black. Legs black, the tarsi yellowish brown. Length 3 mm.

In build, lustre and sculpture of the fore-parts much resembling *circularis* Gr., but the head not so broad, more deeply bisulcate, the thorax as long as broad. Head slightly narrower than the base of the elytra, the eyes very large, occupying the whole side, deeply bisulcate, rather broadly elevated along the middle, the whole surface coarsely and closely punctured, the antennæ scarcely differing from *circularis* in structure. Thorax as long as broad, widest and rounded at the middle, the sides equally retracted in front and behind, posteriorly very slightly sinuate, along the middle narrowly sulcate, coarsely and closely punctured, transversely rugose. Elytra longer (5.2 : 4) and broader than the thorax, slightly transverse, the sides very slightly rounded, the sculpture very similar. Abdomen conical, the first three visible tergites each with three distinct keels, the puncturation of the first four scarcely as coarse or as close as in *circularis*, the 5th scarcely differing, however. The whole

insect without ground-sculpture, the pubescence white and scanty.

♂. 5th sternite at the middle of the posterior margin with a small, more finely and closely punctured and pubescent area : 6th with a small feeble emargination in the middle of the posterior border.

S. Africa : Simon's Town. On a stream bank. Type in my collection.

*Pæderus aquatilis*, sp. n. (Bernh. in litt.).

Very near *sabæus* Er., the colour of the body similar, the antennæ similarly constructed but with the 3rd to 10th segments pitchy : the head of similar shape but post-ocular regions a little shorter and not quite so strongly retracted, the puncturation coarser and rather closer ; thorax with the sides less retracted backwards, impunctate in the middle, but with the punctures elsewhere larger and more numerous ; elytra long as in *sabæus* but not so shining, the puncturation coarser and somewhat rugose ; the abdomen more closely and less finely punctured ; apical third of all the femora and the tibiæ and tarsi pitchy. Length 9.5 mm.

N.W. Rhodesia : Mwenga, 4. viii. 1914 (*Dollman*). Type in my collection.

*Pæderus inconspicuus*, sp. n.

Shining, black, the head with slight blue reflex. Antennæ black, the first two segments yellowish brown. Legs black. Length 5 mm.

A slender species. Head hexagonal, as long as broad, very slightly wider than the thorax, with small umbilicate punctures rather close towards the sides, very sparing on the middle ; ground-sculpture absent except on the antennal tubercles and immediate vicinity. Antennæ slender, 3rd to 10th segments longer than broad, decreasing in length, the 9th and 10th very slightly longer than broad. Thorax slightly longer than broad (2.75 : 2.5), widest at the anterior third, puncturation extremely fine and scanty, scarcely visible ; ground-sculpture absent. Elytra longer (3.2 : 2.75) and broader than the thorax, as long as broad, finely, moderately closely punctured ; ground-sculpture absent. Abdomen finely and rather sparingly punctured on the first four visible

tergites, more closely on the 5th and 6th; ground-sculpture feeble on the first three, distinct on the following. Pubescence silvery, scanty.

S. Africa: Simon's Town. Unique. In my collection.

*Scopæus paludicolu*, sp. n.

Moderately shining, entirely black. Antennæ black, the last three or four segments obscurely reddish. Maxillary palpi with the 3rd segment black. Legs pitchy black, the tarsi yellow. Length 3.3 mm.

Var. *pallipes*, n. Posterior margin of the elytra and posterior half of the suture narrowly obscurely and indeterminate reddish. Antennæ blackish, the first two and 11th segments reddish. Legs reddish yellow.

Blacker and more robust than *peregrinus* Fauv., the thorax more parallel-sided, otherwise very similar in build, but at once distinguished by the well marked coriaceous ground-sculpture and very obsolete and sparing puncturation of the head and thorax. Head a little longer than broad (4:3.5), narrower than the elytra, the temples about twice as long as the eye, the posterior angles rounded, distinctly coriaceous, the punctures extremely fine, obsolete and very scanty. Antennæ as in *peregrinus*. Thorax longer than broad (4.5:3.5), the sides almost parallel, the anterior and posterior angles broadly rounded, before the scutellum with a short shining keel, the ground-sculpture as on the head but the puncturation, although scanty and very fine, more evident. Elytra longer than the thorax (5.5:4.5), a little longer than broad, more shining and without ground-sculpture, the puncturation less fine and closer. Abdomen very finely and closely punctured and pubescent, the fore-parts more sparingly.

S. Africa: Simon's Town. Type in my collection.

*Scopæus* (s. str.) *nigerrimus*, sp. n.

Shining, black. Antennæ yellowish brown, the last four segments reddish yellow. Femora brown, tibiæ reddish yellow, the middle and posterior infusate. Tarsi yellow. Length 3 mm.

Head slightly longer than broad, narrower than the elytra, the eyes small, the temples parallel and fully twice as long, the posterior angles briefly rounded, very finely, rather closely punctured, the ground-sculpture

very fine, coriaceous. Antennæ with the 3rd segment as long as the 2nd, 4th and 5th slightly longer than broad, 6th as long as broad, 7th to 10th slightly transverse. Thorax longer than broad (3.75 : 3), cylindrical, the sides parallel, the anterior and posterior angles broadly rounded, very finely, by no means closely punctured, the ground sculpture very feeble, scarcely visible. Elytra longer than the thorax (4.5 : 3.75), longer than broad (4.5 : 4) and very similarly punctured; ground-sculpture absent. Abdomen very finely and closely punctured and pubescent, less shining. Fore-parts sparingly pubescent.

S. Africa : Simon's Town. Unique. My collection.

*Lathrobium* (s. str.) *curticollis*, sp. n. (Fauvel in litt.).

Shining; head and thorax black; elytra red; abdomen pitchy black, less shining, the posterior margins of the last two tergites narrowly and obscurely reddish. Antennæ reddish, the 4th to 9th segments more or less infuscate. Legs yellowish red. Length 6 mm.

Head as long as broad, a little broader than the thorax, the eyes small, the temples straight and slightly widened towards the briefly rounded posterior angles; sculpture consisting of small umbilicate and not very close punctures, but closer in front, the vertex nearly impunctate. Antennæ slender, 4th and 5th segments longer than broad, 6th as long as broad, 7th to 10th slightly transverse. Thorax longer than broad (3 : 2.75), the sides a little retracted towards the base, impunctate along the middle, elsewhere with punctures much as on the head. Elytra longer than the thorax (3.75 : 3) the punctures smaller and not so close, scarcely umbilicate. Abdomen very finely and closely punctured and pubescent, the fore-parts sparingly. The whole insect without ground-sculpture.

♂ : 6th sternite with deep arcuate excision. 5th with small triangular impression at the middle of the posterior margin, its surface covered with short black spines.

S. Africa : Simon's Town. Type in my collection.

*Lathrobium* (s. str.) *mixtum*, sp. n.

Shining, black, the elytra with the shoulders, reflexed sides, posterior margin and suture narrowly reddish yellow. Antennæ reddish brown, the 2nd and 11th segments reddish yellow. Legs reddish. Length 5 mm.



Smaller than *cafrum* Boh., differently coloured, the thorax more retracted behind, elytra and antennæ shorter, the former without keel on the reflexed side. Head as long as broad, suborbicular, slightly broader than the thorax, with small scattered umbilicate punctures, smaller but more numerous than in *cafrum*, the vertex almost impunctate. Antennæ slender, 2nd and 3rd segments of equal length, 4th and 5th very slightly longer than broad, 6th as long as broad, 7th to 10th transverse. Thorax slightly longer than broad (2·4 : 2), the sides distinctly retracted to the base, broadly impunctate along the middle, elsewhere with scattered punctures like the head but smaller at the sides. Elytra longer (3 : 2·4) and broader than the thorax, with five or six rows of small close punctures, the reflexed sides almost impunctate. Abdomen very finely, rather closely punctured and pubescent, with very fine transverse ground-sculpture. Fore-parts without ground-sculpture and sparingly pubescent.

♂ : unknown.

S. Africa : Simon's Town. Unique. My collection.

\* *Lathrobium (Lobrathium) capicola*, sp. n.

Shining, black. Antennæ with the 2nd, 10th and 11th segments reddish, the rest black. Legs dark brown, the apices of the tibiæ and the tarsi reddish. Length 13 mm.

A robust species. Head transverse (5 : 4·5), orbicular, broader than the thorax, the eyes small, closely, moderately coarsely punctured, the anterior border impunctate. Antennæ slender, the 4th to 8th segments longer than broad, decreasing in length, 9th and 10th as long as broad. Mandibles long and prominent, each with three sharp teeth. Thorax as long as broad, the sides straight, slightly retracted to the rounded posterior angles, along the middle with narrow impunctate space, elsewhere more coarsely and rather less closely punctured than the head. Elytra longer (5·75 : 4) than the thorax, with strong lateral keel not reaching the shoulder, more coarsely punctured. Abdomen very finely and very closely punctured and pubescent. Fore-parts sparingly pubescent. Ground-sculpture absent throughout.

♂ : unknown.

S. Africa : Simon's Town. Unique. My collection.

*Dolicaon giganteus*, sp. n.

Very near *lathrobioides* Cast., and only differing in the larger size (20 mm.) and more deeply and closely punctured head and thorax and rather more coarsely sculptured elytra. The head, thorax and abdomen are distinctly coriaceous, but the elytra without ground-sculpture.

♂: 6th sternite narrowly and deeply excised.

S. Africa (Caffraria, without further indication) Type in my collection.

*Dolicaon intermedius*, sp. n.

Black, head and thorax somewhat dull, elytra and abdomen shining. Antennæ reddish yellow. Legs yellowish red. Length 15 mm.

Head subquadrate, slightly transverse, a little narrower than the thorax, the posterior angles rounded, the eye a good deal shorter than the temple, broadly impunctate in front and along the middle to the posterior level of the eyes, the base and sides with small, moderately close umbilicate punctures. Antennæ slender, the penultimate segments a little longer than broad, pyriform. Thorax longer than broad (10:7.3), the sides very slightly rounded, more retracted towards the base, along the middle with narrow impunctate line, elsewhere with by no means close scattered punctures similar to those of the head, but smaller and more scanty at the sides. Elytra shorter (6:10) than the thorax, wider behind and there as broad, the punctures small, not very close, more or less transversely rugulose. Abdomen moderately finely, rather closely punctured, the ground-sculpture very fine and transverse. Head and thorax with distinct coriaceous ground-sculpture, elytra without.

♂: unknown.

S. Africa · Simon's Town. Type in my collection.

*Actobius capensis*, sp. n.

Shining, black. Antennæ blackish, the last segment reddish yellow. Legs reddish yellow. Length 5 mm.

Except for the shorter elytra resembles *cinerascens* Gr. in build and antennal structure, but the whole insect, especially the fore-parts, are much more sparingly punctured and the ground-sculpture much weaker. Head very

slightly longer than broad (2.4 : 2.3), subquadrate, as broad as the thorax, the eyes moderate, distinctly shorter than the temples, broadly impunctate along the middle, elsewhere finely and not closely punctured : ground-sculpture coriaceous. Antennæ as in *cinerascens*. Thorax slightly longer than broad (3 : 2.3), the sides almost parallel, broadly impunctate along the middle, on each side with dorsal row of 8 or 9 small punctures, externally with a few others irregularly placed : ground-sculpture weaker than on the head. Elytra a little longer than the thorax (3.5 : 3), much less finely and much less closely punctured than in *cinerascens*, the abdomen also less densely punctured than in that species.

♂ : 6th sternite with small, feeble arcuate emargination.  
S. Africa : Simon's Town. Type in my collection.

*Philonthus cyanopterus*, sp. n.

Shining, head thorax and abdomen black, elytra dark blue. Thorax with dorsal row of five punctures. Antennæ black, the 1st segment yellowish brown. Anterior and middle femora reddish brown, the posterior black : tibiæ black, tarsi pitchy. Length 6 mm.

Near *rufimanus* Gr., very similar in build but smaller and narrower, the elytra of darker blue colour, the antennæ shorter with transverse penultimate segments. Head as long as broad, orbicular, narrower than the thorax, the eyes flat, almost as long as the post-ocular region ; median interocular punctures widely separated, behind the eyes with a few small punctures. Antennæ rather short, slender, the 3rd segment a little shorter than the 2nd, 4th and 5th as long as broad, 6th to 10th transverse, not increasing in width. Thorax a little longer than broad (3 : 2.75), the sides straight and practically parallel, with dorsal row of five small punctures and two others externally. Elytra a little longer (3.5 : 3) and broader than the thorax, slightly longer than broad, rather less finely and more closely punctured than in *rufimanus*. Abdomen rather closely, moderately finely punctured, rather less finely in the impressions. First segment of posterior tarsi shorter than the last. Ground-sculpture on the head and thorax scarcely visible, absent on elytra, very fine on the abdomen.

S. Africa : Simon's Town. In a marsh. Type in my collection.

*Philonthus (Gabrius) meridionalis*, sp. n.

Shining, head, thorax and abdomen black, elytra pitchy black or pitchy brown. Thorax with dorsal row of five punctures. Antennæ black, the first two segments reddish yellow. Legs reddish yellow, the tibiæ slightly infuscate. Length 4-4.5 mm.

Near *thermarum* Aubé, but larger and more robust and of darker colour. Head very slightly longer than broad (4.4 : 4), very slightly widened behind, narrower than the thorax and in other respects similar to *thermarum* and with similarly constructed antennæ. Thorax as in *thermarum*. Elytra as long as the thorax, more closely punctured than in that species, the abdomen scarcely differing from that of *thermarum*.

S. Africa : Simon's Town. Type in my collection.

*Philonthus (Gabrius) pseudopennatus*, sp. n.

Very near *pennatus* Shp., of similar colour but with the basal segments of the antennæ dark, the head yet narrower and longer (2.3 : 1.8), oval, narrower than the thorax, the post-ocular region slightly retracted to the base; sides of thorax straight, more retracted towards the front than in *pennatus*. Elytra only as long as the thorax, the sculpture and that of the abdomen scarcely differing from that of *pennatus*. Length 4.75 mm.

S. Africa : Simon's Town. In a marsh. Type in my collection.

*Acylophorus capensis*, sp. n.

Shining, black, the abdomen slightly iridescent. Antennæ black, the base of the first segment reddish yellow, the 11th obscurely reddish. Legs brownish red, the middle and posterior femora and tibiæ blackish, tarsi reddish yellow. Length 7 mm.

Extremely like *glaberrimus* Hbst., but with the head more widened behind the eyes, these a little shorter, the thorax with the sides straight and much more strongly retracted towards the front, the elytra more finely and more closely punctured, the abdomen more finely and distinctly more closely punctured and iridescent. Head a little broader than long (3.5 : 3), wider behind, the post-ocular region rounded and a little dilated, between the eyes with a pair of widely-separated punctures, the disc

with a few minute, scarcely visible punctures, behind the eyes finely and rather closely punctured. Thorax transverse (5 : 4·2), the sides straight and strongly retracted towards the front, the disc bipunctate, towards the sides with a row of three setiferous punctures, the side-margins with five others. Scutellum asperately punctured. Elytra slightly longer (4·5 : 4·2) and broader than the thorax, transverse, closely, finely and asperately punctured. Abdomen finely, closely punctured at the bases of the anterior segments, less closely elsewhere. The whole insect without ground-sculpture.

S. Africa : Simon's Town. Unique. My collection.

*Comosoma cylindricum*, sp. n.

Shining reddish yellow. Antennæ with the first three segments reddish yellow, the following infusate. Legs reddish yellow. Length 2 mm.

Differs from *lividum* Er. in the shorter elytra, lighter colour, thinner and darker antennæ, the penultimate segments as long as broad : the sculpture of the head and thorax scarcely differs, but that of the elytra and abdomen (especially the latter) distinctly finer : the elytra are shorter than the thorax (1·75 : 2).

S. Africa : Simon's Town. Type in my collection.

*Cordalia capensis*, sp. n.

Shining, dark reddish brown, the 4th visible tergite blackish. Antennæ blackish, the first two segments brownish yellow. Legs reddish yellow. Length 2·75 mm.

Near *obscura* Gr., but more closely punctured, the head round, the antennæ similarly constructed but not so stout. Head orbicular, as broad as the thorax, convex, the puncturation much as in *obscura*. Thorax as long as broad, cordate, convex, along the middle with fine impressed line, more closely punctured and pubescent than *obscura*. Elytra as long as but broader than the thorax, the puncturation closer and distinctly less fine than in that species. Abdomen as closely but rather less finely punctured than in *obscura*.

♂ : head not impressed : 7th tergite with feeble arcuate emargination in the middle of the posterior border as in *obscura*.

S. Africa : Simon's Town. Type in my collection.

*Falagria* (s. str.) *capensis*, sp. n.

Very near *coarcticollis* Fauv., and only differing in the following respects :—the head is orbicular, slightly broader than the thorax (3 : 2·75), the transverse impression behind the frontal elevation less indicated, the eyes a little smaller ; thorax narrower, slightly longer than broad (3 : 2·75), less dilated in front ; elytra as finely but obviously less closely punctured, transverse (4·3 : 3·75) ; abdomen much less closely punctured. Length 2 mm.

S. Africa : Simon's Town. Unique. In my collection.

*Falagria* (*Ananlacaspis*) *caffra*, sp. n. (Bernh. in litt.)

Rather shining, yellow, the head reddish yellow, the 4th and 5th visible tergites infusate. Antennæ reddish yellow. Legs yellow. Length 2·75 mm.

In colour much like *subrugosa* Kr., but larger, the antennæ shorter and stouter, the thorax more strongly dilated in front and more strongly constricted behind, the abdomen much more closely punctured. Head transverse, subquadrate, as broad as the thorax, the posterior angles rounded, the front and along the middle narrowly impunctate, elsewhere very finely and moderately closely punctured. Antennæ rather stout, the 2nd and 3rd segments subequal, 4th and 5th about as long as broad, the following slightly transverse, slightly increasing in width. Thorax as long as broad, rather strongly rounded and dilated in front, sulcate along the middle, the puncturation as on the head but closer. Elytra slightly longer and a good deal broader than the thorax, transverse (5 : 4), nearly the whole basal half finely closely and asperately punctured, elsewhere more finely, less closely and simply punctured. Abdomen with the first four visible tergites rather coarsely and closely punctured in the impressions, very finely and more sparingly elsewhere, the 4th and 5th finely and rather closely punctured. Ground-sculpture absent throughout.

Zululand : Eshowe, July, 1926. (*Turner*). Type in British Museum.

*Tachyusia* (s. str.) *capicola*, sp. n.

Shining, black. Antennæ black, the last segment dirty yellowish red. Legs pitchy, the bases of the femora and tarsi reddish yellow. Length 2·5 mm.

Very near *nigerrima* Cam., but a little narrower, the antennæ longer, the thorax more narrowed behind and with very fine asperate punctures, the elytra more distinctly punctured. Head orbicular, as broad as the thorax, extremely finely, moderately closely punctured. Antennæ with 2nd and 3rd segments of equal length, 4th to 7th longer than broad, decreasing in length, 8th to 10th about as long as broad. Thorax as long as broad, the sides rounded and dilated in front, rather strongly sinuately retracted behind, with broad impression on the posterior half, much deeper before the scutellum, the puncturation very fine but asperate and moderately close. Elytra very slightly longer but distinctly broader than the thorax, transverse (4.75 : 4), about as closely but more finely and simply punctured. Abdomen narrowed at the base, coarsely and closely punctured in the impressions, extremely finely and sparingly elsewhere but more closely on the 4th and 5th visible tergites. Ground-sculpture absent throughout.

S. Africa : Simon's Town. Type in my collection.

*PARAGNYPETA*, gen. nov.

Very near *Gnypeta* Thoms., and only differing from it in the structure of the tongue, which is triangular with a small notch at the apex, the more indistinctly impressed anterior sternites and the secondary sexual characters of the ♂.

*Paragnypeta rivularis*, sp. n.

Colour and general facies of *Gnypeta carbonaria* Mannerh., but with narrower head and thorax, shorter, stouter antennæ and less closely punctured abdomen.

Head suborbicular, narrower than the thorax, the eye about as long as the post-ocular region, as finely and about as closely punctured as that species. Antennæ with the 3rd segment as long as the 2nd, 4th as long as broad, 5th to 10th transverse, increasing in width, the penultimate about twice as broad as long. Thorax convex, transverse (3.5 : 3), the sides rounded in front, straight and retracted behind, the posterior angles scarcely indicated, the puncturation fine like that of the head but closer. Elytra longer (3.5 : 3) and broader than the thorax, scarcely emarginate postero-externally, transverse (4.75 : 3.5), the

puncturation fine, asperate and closer, not so fine and rougher than in *carbonaria*. Abdomen a little narrowed at apex, very finely and not closely punctured, the basal impressions without punctures. The whole insect without ground-sculpture except on the last two tergites, where some indication is present. Pubescence fine and depressed. Length 2.5 mm.

♂: puncturation of elytra in the sutural region, especially at base, coarser and rougher than elsewhere: 7th tergite with a long sharp keel in the middle 8th with a pair of blunt teeth at the middle of the truncate posterior margin.

S. Africa Simon's Town. In flood débris Type in my collection.

*Atheta (Hydrosmeeta) capensis*, sp. n.

Moderately shining, black, the elytra pitchy. Antennæ and legs reddish yellow. Length 1.5 mm.

Near *subtilissima* Kr., but narrower and blacker with much more strongly punctured head and thorax. Head as long as broad, quadrate, scarcely narrower than the thorax, the posterior angles rounded, the eyes small, much shorter than the temples, the disc with a small fovea, the puncturation fine, close and deep: ground-sculpture absent. Antennæ rather shorter and more slender than in *subtilissima*, the 3rd segment about half as long as the 2nd, 4th to 10th slightly transverse, only increasing a little in width, the 11th as long as the 9th and 10th together. Thorax as long as broad, about as long and as broad as the head, the sides straight and moderately retracted, along the middle sometimes with an obsolete sulcus, the puncturation as close but rather finer and obviously less deep than on the head. Elytra longer (2.3 : 1.75) and broader than the thorax, as long as broad, very finely and very closely punctured. Abdomen parallel, very finely and rather closely punctured, more closely than in *subtilissima*. The whole insect with a very fine, moderately close pubescence and without ground-sculpture.

S. Africa: Simon's Town. On the bank of a stream. Type in my collection.

*Atheta (Microdota) capicola*, sp. n.

Rather shining, black, the elytra pitchy black. Antennæ black. Legs reddish yellow, the tibiæ infusate. Length 1.2 mm.



In size, build, colour and antennal structure scarcely differing from *mortuorum* Thoms., but more shining, the fine granular sculpture of the head and thorax less fine, the ground-sculpture less evident; that of the elytra less fine, closer and more shining than in *mortuorum*; abdomen with closer and not quite such fine granular sculpture as in that species, and the 4th to 6th visible tergites are as closely punctured as the basal ones. Head with a small fovea on the disc.

S. Africa: Simon's Town. Unique. In my collection.

*Atheta (Dimetrota) perparva*, sp. n.

Rather shining, black, the elytra pitchy black. Antennæ black. Legs reddish yellow. Length 1.75 mm.

A small, narrow, roughly-punctured species. Head suborbicular, narrower than the thorax (2:2.5), eyes rather small, shorter than the post-ocular region, except in front finely, closely and roughly punctured. Antennæ slender, the 3rd segment as long as the 2nd, 4th as long as broad, 5th to 10th slightly transverse, differing but little, 11th as long as the three preceding together. Thorax slightly transverse (2.5:2), the sides straight behind and a little retracted, without lateral setæ, the sculpture as on the head. Elytra slightly longer than the thorax (2.5:2), transverse (3:2.5), not emarginate postero-externally, the sculpture similar. Abdomen narrowed from base to apex, very finely, moderately closely punctured on the anterior tergites, more sparingly behind, the ground-sculpture fine, the pubescence fine and rather long, the sides and posterior margins of the tergites without long setæ. Fore-parts without ground-sculpture. Middle tibiæ with a weak seta.

S. Africa: Simon's Town. Unique. In my collection.

*Atheta (Acrotona) falsa*, sp. n.

Moderately shining; head and abdomen black, the last tergite yellowish; thorax and elytra dark reddish brown. Antennæ black, the first segment yellowish brown. Legs reddish yellow. Length 2.5 mm.

In build, colour and lustre much like *fungi* Gr., but with differently constructed antennæ, thorax less transverse with the sides behind less rounded and retracted, more

closely punctured, elytra and abdomen more finely and more closely punctured, the latter more closely pubescent. Head and thorax finely, closely and roughly punctured, the former with very fine ground-sculpture, the latter transverse (4.2 : 3.2) and without ground-sculpture. Antennæ stouter than in *fungi*, the 4th segment as long as broad, the 5th slightly longer than broad, the 6th to 10th as long as broad or slightly transverse and differing but little, 11th as long as the 9th and 10th together. Elytra with puncturation similar to that of the thorax, distinctly finer than in *fungi*. ground-sculpture absent. Abdomen finely and closely punctured, more sparingly on the last three segments, much more finely and closely than in *fungi* and with closer pubescence, the ground-sculpture very fine and reticulate. Middle and posterior tibiæ each with two fine black setæ.

♂. 6th sternite a little produced, the posterior border with feeble emargination.

S. Africa : Simon's Town. In flood debris. Type in my collection.

*Atheta (Acrotona) fimicola*, sp. n.

Rather shining, head black, thorax dark reddish brown. Legs reddish yellow. Length 2.75 mm.

Near *fungi* Gr., but a good deal narrower, the thorax distinctly narrower, the antennæ and elytra shorter, the puncturation throughout much closer and finer. Head closely and finely punctured. Antennæ with 4th segment as long as broad, 5th to 10th transverse, slightly increasing in width, 11th as long as the 8th, 9th and 10th together. Thorax transverse (3.1 : 2.5), the sides more retracted behind than in front, the sculpture as on the head. Elytra slightly longer than the thorax (3 : 2.5), transverse (4 : 3), not emarginate postero-externally, the puncturation rougher. Abdomen narrowed from base to apex, very finely and rather closely punctured, scarcely less closely behind, the ground-sculpture very fine and reticulate, pubescence fine and rather close, without long black setæ. Fore-parts without ground-sculpture. Tibiæ without distinct setæ.

S. Africa : Simon's Town. In dung. Unique. My collection.

*Atheta (Acrotoma) densicauda*, sp. n. (Bernh. in litt.).

Black, the elytra pitchy black, the fore-parts shining, the abdomen dull. Antennæ black. Legs reddish yellow, the femora infusate. Length 3 mm.

In size, build and antennal structure much resembling *aterrima* Gr., but with the fore-parts much more shining, less closely punctured, the abdomen dull, much more densely punctured and pubescent. Head shorter and broader than in *aterrima*, rather more finely and less closely punctured, more shining, the ground-sculpture less evident. Antennæ scarcely differing. Thorax as finely but rather less closely punctured than in *aterrima*, more shining and without ground-sculpture. Elytra emarginate postero-externally, not quite so closely punctured as in *aterrima*, more shining and without ground-sculpture. Abdomen narrowed from base to apex, very finely and very densely punctured and pubescent and with a fine ground-sculpture, the sides and posterior margins of the tergites with a few long black setæ. Middle tibiæ with two, posterior with one, black setæ.

S. Africa: Simon's Town. In dung. Type in my collection.

*Atheta (Acrotoma) turneri*, sp. n. (Bernh. in litt.)

Colour and build of *densicauda* Cam., but smaller (2.5 mm.) and at once distinguished by the shining and only moderately closely punctured abdomen, different antennal structure, and also in the following respects: - the head is less finely and more roughly punctured and without ground-sculpture, antennæ more slender, the 4th to 6th segments a little longer than broad, 7th as long as broad, 8th to 10th slightly transverse. 11th as long as the 9th and 10th together; thorax less transverse, a little less finely and a little less closely punctured, without ground-sculpture; elytra not quite so closely punctured and without ground-sculpture; abdomen much less finely and much less closely punctured and pubescent, less finely and less closely than in *aterrima* Gr., and with much less evident ground-sculpture, the pubescence long, the sides and posterior margins of the tergites with long black setæ. Middle and posterior tibiæ each with two black setæ.

S. Africa: Simon's Town. Type in my collection.

*Atheta (Acrotona) depravata*, sp. n

Black, shining, the elytra brownish red, infuscate about the scutellum. Antennæ black. Legs reddish yellow. Length 2.5-3 mm.

In colour, build and lustre much resembling *nigerrima* Aubé, but larger, with longer thinner antennæ and longer thorax, the puncturation coarser and rougher. Head closely, finely and roughly punctured, suborbicular. Antennæ long and slender, 2nd and 3rd segments of equal length, 4th to 7th longer than broad, decreasing in length, 8th to 10th about as long as broad, 11th a little longer than the 9th and 10th together. Thorax transverse (5:3.5), distinctly more narrowed in front than behind, the puncturation as on the head. Elytra as long as the thorax, transverse (5.75:3.5), slightly emarginate postero-externally, very similarly punctured. Abdomen narrowed from base to apex, finely and rather closely punctured on the first three visible tergites, gradually more sparingly on the following, the ground-sculpture fine and transverse, the pubescence fine, rather long, the sides and posterior margins of the tergites with long setæ. Fore-parts without ground-sculpture. Middle and posterior tibiæ each with two long and strong black setæ.

S. Africa: Simon's Town. In dung. Type in my collection.

*Atheta (Acrotona) provincialis*, sp. n. (Bernh. in litt.).

Colour, lustre and build of *nigerrima* Aubé, but with longer and thinner antennæ, the penultimate segments much less transverse, the terminal segment much longer, head and thorax more closely punctured, the elytra slightly emarginate postero-externally, the abdomen with longer and more numerous black setæ. Antennæ with the 2nd and 3rd segments distinctly longer than in *nigerrima*, 4th and 5th slightly longer than broad, the 6th to 10th distinctly less transverse than in that species, the 11th as long as the three preceding together; from *turneri* Cam. it differs in the smaller size and shorter antennæ and finer and closer puncturation. Middle and posterior tibiæ each with two long black setæ. Length 2 mm.

Africa: Simon's Town. In dung. Type in my collection.

*Atheta (Acrotona) fimi*, sp. n.

Very near *provincialis* Cam., but smaller (1.5 mm.) and narrower, the antennæ similarly constructed but thinner, the puncturation of the head and thorax not quite so fine, closer and rougher, the elytra not emarginate postero-externally, in all other respects similar.

S. Africa: Simon's Town. In dung. Type in my collection.

*Atheta (Acrotona) rufibasis*, sp. n. (Bernh in litt.  
*capensis* Fauv. in litt.).

Rather shining, black, the posterior margins of the tergites rufescent, the elytra reddish yellow more or less infusate postero-externally. Antennæ black, the 1st segment and legs reddish yellow. Length 3 mm.

In colour and build much resembling *jimorum* Bris., but larger and more robust, the antennæ slightly longer, the puncturation of the head and thorax as close but finer, that of the elytra and abdomen scarcely differing from that of *jimorum* and with similar pubescence. Head moderately finely and moderately closely punctured, finely coriaceous. Antennæ with the 3rd segment slightly longer than the 2nd, 4th slightly longer than broad, 5th stouter, fully as long as broad, 6th to 10th transverse, 11th as long as the 9th and 10th together. Thorax transverse (5:3.75), the sides slightly more retracted towards the front than behind, before the scutellum with a fovea, finely and rather closely punctured, finely coriaceous. Elytra longer (4:3.75) than the thorax, at the base as broad, transverse, scarcely emarginate postero-externally, finely, rather closely asperately punctured, finely coriaceous. Abdomen very finely, moderately closely punctured and pubescent on the anterior tergites, much more sparingly behind, the ground-sculpture fine and transverse. Tibiæ without setæ.

♂: 8th tergite with a short cultriform process on each side of the posterior margin, in the middle with a pair of blunt teeth much as in *laticollis* Steph.

S. Africa: Simon's Town. In dung. Type in my collection.

*Atheta (Acrotona) pseudofimorum*, sp. n.

Shining, black, the posterior margins of the tergites rufescent. Antennæ black, the first three segments and legs reddish yellow. Length 3 mm.

Build of *fimorum* Bris., but darker, the head more finely and less closely punctured, the antennæ similar in structure; thorax with the sides more retracted to the base, the puncturation as fine but not so close; elytra distinctly less finely and less closely punctured; the abdomen scarcely differing. The head is broad as in *fimorum*, thorax transverse (4.75 : 3.3), broader than the elytra at the base, the elytra only slightly longer than the thorax. Ground-sculpture distinct throughout. Tibiæ without distinct setæ.

S. Africa: Simon's Town. In dung. Type in my collection.

*Atheta (Acrotona) cafra*, sp. n.

Shining, black, the thorax and elytra dark reddish brown. Antennæ black. Legs reddish yellow. Length 1.5 mm.

Head large, quadrate, only slightly narrower than the thorax, the eyes about as long as the temples, finely, closely and somewhat roughly punctured, finely coriaceous. Antennæ slender, the 3rd segment as long as the 2nd, 4th as long as broad, 5th to 10th transverse, slightly increasing in width, the penultimate scarcely a half broader than long, the 11th elongate, as long as the three preceding together. Thorax narrow, scarcely transverse (2.1 : 2), the sides gently rounded, slightly more retracted behind than in front, along the middle with fine impressed line, the puncturation very similar to that of the head but without ground-sculpture. Elytra slightly longer and distinctly broader than the thorax, transverse (3 : 2.2), the sculpture very similar. Abdomen narrowed from base to apex, the puncturation throughout fine and by no means close, the ground-sculpture very fine and reticulate. Pubescence throughout rather long. Middle tibiæ each with two fine black setæ.

S. Africa: Simon's Town. In dung. Type in my collection.

*Atheta (Acrotona) tristis*, sp. n. (Bernh. in litt.).

Moderately shining, black. Antennæ black, the first three segments yellowish brown. Legs reddish yellow. Length 1.4 mm.

A minute species with sculpture of the fore-parts similar in character to that of *cribrata* Kr., but finer. Head narrower than the thorax, closely covered with small granules. Antennæ slender, the 3rd segment as long as the 2nd, 4th as long as broad, 5th to 10th transverse, scarcely increasing in width and differing but little, 11th as long as the 9th and 10th together. Thorax transverse (3 : 2), the sides evenly rounded, a little more retracted in front, the sculpture as on the head. Elytra a little longer (2.5 : 2) than the thorax, scarcely emarginate postero-externally, transverse (3 : 2.5), with similar but rather finer sculpture. Abdomen narrowed towards the apex, densely and finely punctured and pubescent throughout, with very fine reticulate ground-sculpture and without long black setæ. Tibiæ without setæ.

S. Africa : Simon's Town. Type in my collection.

*MIMOBATES*, gen. nov.

In build very much resembling *Mniobates forticornis* Lac. Temples strongly bordered below. Labrum transverse, the sides and anterior angles rounded, the front margin very slightly produced and rounded in the middle. Mandibles small, pointed, edentate. Maxillary palpi with small 1st segment, 2nd slightly curved and a little thickened towards apex, 3rd as long as the 2nd, gradually thickened and broader at the apex than the 2nd, 4th subulate, more than half as long as the 3rd. Inner lobe of maxilla pointed, longer than the outer, finely spined internally ; outer lobe broader than inner, membranous at apex and closely covered with short hairs. Mentum transverse, trapezoidal, truncate in front, the sides feebly emarginate. Labial palpi 2-segmented, the 1st rather stout, twice as long as broad, a little narrowed towards apex, 2nd cylindrical, nearly as broad as the apex of the 1st and slightly longer, the apex rounded. Tongue very narrow, scarcely as long as the 1st segment of the labial palpi and split nearly to the base into two very narrow diverging lobes. Paraglossæ not extending beyond the base of the tongue. Prosternum rounded behind, the anterior half keeled along the middle. Pronotal epipleura visible from the side. Mesosternum keeled, its process acute, extending more than half the length of the coxæ and meeting the briefly rounded apex of the metasternum, the coxæ narrowly separated behind. Elytra emarginate

postero-externally. Legs moderate. Tibiæ finely ciliate. Tarsi 4, 5, 5, the anterior with the first three segments short, equal, 4th longer than the three preceding together : middle with the first four segments rather short, but slightly increasing in length, the 5th as long as the three preceding together : posterior with the first four segments scarcely differing in length, a little longer than broad, the 5th as long as the three preceding together. Abdomen slightly narrowed before apex, the first three visible tergites transversely impressed at base.

*Mimobates capensis*, sp. n.

Fore-parts moderately, abdomen more strongly shining. Head and thorax dark reddish brown ; elytra reddish ; abdomen dark reddish brown, the 4th visible tergite black, the 6th yellowish, the posterior margins of the anterior tergites rufescent. Antennæ black, the first three segments reddish. Legs reddish yellow. Length 2.5-3 mm.

Both in build and colour much resembling *Mniobates forticornis* Lac., but much smaller, the antennæ much thinner, the sculpture different. Head suborbicular, narrower than the thorax, the eye rather small, much shorter than the rounded post-ocular region, finely, not very closely punctured, finely coriaceous. Antennæ with 1st segment shorter than the 2nd, 2nd and 3rd of equal length, 4th very slightly longer than broad, 5th to 10th gradually more transverse, the penultimate about twice as broad as long, the 11th as long as the 9th and 10th together. Thorax slightly transverse (3.5 : 3.2), the sides rounded in front, straight and retracted behind, the posterior angles rounded, the puncturation fine but not so fine as on the head and closer and asperate, the coriaceous ground-sculpture stronger. Elytra slightly longer (3.5 : 3.2) and broader than the thorax, transverse (4.5 : 3.5), the puncturation a little less fine, moderately close and asperate, the ground-sculpture fine, more or less transverse and wavy. Abdomen slightly narrowed before the apex, very finely rather sparingly punctured, in the impressions finely crenulate, the ground-sculpture very fine and transverse. Fore-parts with rather long, moderately close, suberect yellow pubescence, the abdomen much less closely pubescent.



No secondary sexual characters present in the examples examined.

S. Africa : Simon's Town. Type in my collection.

*Tinotus claricornis*, sp. n.

Moderately shining, black, the posterior margins of the tergites narrowly rufescent. Antennæ yellowish red, the 11th segment black. Legs reddish yellow. Length 2.3 mm.

In build somewhat like *minutus* Bernh., but with narrower thorax, and at once distinguished by the short thick antennæ and the sculpture. Head, except in front, rather closely covered with small flat umbilicate punctures; ground-sculpture distinct. Antennæ very short and stout, the 3rd segment a little shorter than the 2nd, 4th small, transverse. 5th to 10th more transverse, increasing in width, the penultimate segments four times broader than long. Thorax transverse (3.75 : 3), convex, along the middle superficially impressed, with rather close, granular, umbilicate sculpture and distinct ground-sculpture. Elytra as long as but broader than the thorax, transverse (4.5 : 3), with similar but less close granular sculpture and strong ground-sculpture. Abdomen with fine sparing puncturation, much as in *minutus* but with stronger ground-sculpture.

S. Africa : Simon's Town. In dung. Type in my collection.

*Blepharrhymenus capicola*, sp. n. (Fauvel in litt.).

Rather shining; head black, thorax and elytra dark reddish brown, the sides of the former obscurely lighter. Abdomen black, the raised side and posterior margins of the first two visible tergites yellowish red. Antennæ red, the first three segments yellowish red. Legs reddish yellow. Length 3.2 mm.

Head round, as broad as the thorax, the eyes large but shorter than the post-ocular region, extremely finely and sparingly punctured, finely coriaceous. Antennæ extending to the shoulders, the 3rd segment a little shorter than the 2nd, 4th about as long as broad, 5th to 10th transverse, gradually increasing in width, the penultimate about twice as broad as long, 11th a little longer than the 9th and 10th together. Thorax as long as broad, the sides rounded

in front, almost straight and strongly retracted behind, before the scutellum with a transverse sulcus, the punctures at the sides almost as fine as on the head and very sparing, along the middle much closer and much less fine, especially on the posterior half, where they are granular. ground-sculpture stronger than on the head. Elytra longer (4 : 3·5) and broader than the thorax, transverse (5·5 : 4), the posterior half very finely and sparingly punctured, the anterior with much larger and closer umbilicate punctures : ground-sculpture scarcely visible. Abdomen slightly widened towards the apex, in the impressions with some coarse punctures, elsewhere very finely and very sparingly punctured, the ground-sculpture scarcely visible except on the 4th and 5th visible tergites, where it is quite distinct. Pubescence moderate on the fore-parts, very scanty on the abdomen.

S. Africa : Simon's Town Type in my collection.

*Aleochara (Coprochara) dubiosa*, sp. n. (Bernh. in litt.).

Colour and build of *hipustulata* L., but the antennae longer and more slender, the penultimate segments less transverse, punctures of the dorsal thoracic rows more numerous but finer and more superficial, elytra as closely but more finely and less deeply punctured, abdomen more closely punctured, legs usually darker, pitchy, with the tarsi often lighter. Length 3·4 mm.

S. Africa Simon's Town. In dung Type in my collection.

*Aleochara (Eucharina) sulcipotens* Bernh.

Var. *distincta*, n. Differs from the type-form in the red elytra, with the sides a little infuscate.

Var. *differens*, n. Differs from *distincta* in the thorax being red, with the disc more or less infuscate and the posterior margins of the tergites rufescent.

Var. *distinguenda*, n. Differs from the type-form in the head with a pair of red spots on the disc, the red thorax and elytra and the posterior margins of the tergites rufescent.

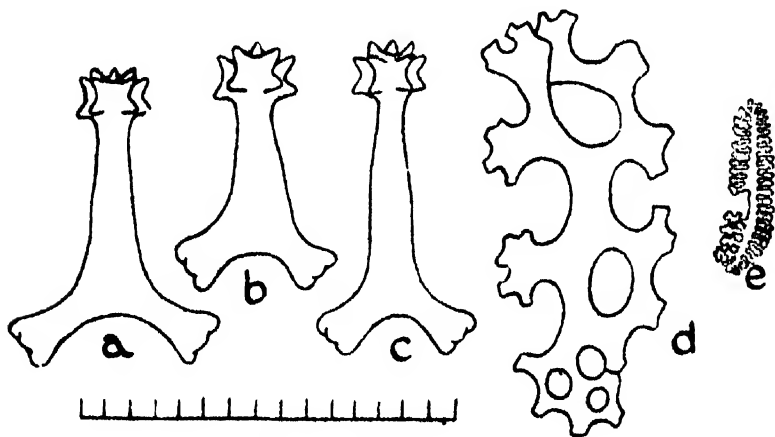
S. Africa : Simon's Town. All taken with the type-form.

**LXII.**—*Urodeimas bifurcatum*, a new Holothurian from South Africa, with a Revision of the Genus *Urodeimas* Selenka. By ELISABETH DEICHMANN.

*Urodeimas bifurcatum*, sp. nov.

*Diagnosis.*—Stout, thick-skinned form, feet in five crowded hands, soft, contractile, slightly smaller dorsally; tentacles 20, ten larger with five slightly smaller inside to these, and five much smaller in an inner circle. Calcareous ring with tall, narrow radials, posteriorly deeply incised; interradianals also narrow; the connection between the pieces partly obscured by the soft tissue; numerous small, free stone canals and Polian vesicles

Fig. 1.



*Urodeimas bifurcatum*, sp. n.

a-c, tables from skin; d, plate from tube-foot; e, rosette from tentacle.

forming a fringe around the circular canal; gonads as numerous slender tubes in two tufts.

Spicules numerous rods, derived from modified tables, placed vertically in the skin, with bifurcate base and the tip ending in a cluster of spines, normally three pairs of double spines; feet with large end plate and several marginal plates but no supporting rods in the walls; dorsal appendages with smaller end plate; introvert with spicules of the same type as in the skin and furthermore two-pillared tables with small disk and the spire

ending in a few spines; tentacles with delicate rods and rosettes.

*Type*.—South African Museum; paratype in M.C.Z.

*Type-locality*.—Umtvalumi, south of Durban, South Africa.

*Distribution*.—At present reported from the type-locality only.

*Specimens examined*.—The type and a slightly smaller paratype.

*Remarks*.—The type measures about 6 cm. with the tentacles withdrawn; the paratype is slightly smaller; the gonads are well developed in both individuals, but very likely the animals are not quite full grown.

The spicules are of so unique a type that the possibility must be considered that they are not normal and that future specimens may be discovered to possess simple, rod-shaped tables with undivided base.

Externally as internally the new species resembles *Pseudocucumis aciculum* (Semper), reported from Mauritius, and it was a surprise to discover that it had spicules which were more of the type characteristic of the genus *Urodemas*.

Comparison between Semper's species and the type-species of *Urodemas*, *U. perspicillum* Selenka, revealed that except for the serial arrangement of the feet in *aciculum* it agrees perfectly with Selenka's species in the arrangement of the tentacles and its inner anatomy. As for the spicules, they are actually derived from the same type, viz., a table with reduced disk and an exaggerated spire in which the four pillars normally have fused completely; in *aciculum* the spire ends in a smooth point while in *Urodemas perspicillum* a cluster of sharp spines is present.

Ekman, 1918, p. 56, realized the affinities between his "*Phyllophorus hamatum*" (*Urodemas schmeltzii* (Ludwig), nec *P. hamatum* Sluiter) and *aciculum*, and he was the first to understand that the spicules were essentially of the same type. Unfortunately he had no occasion to examine any specimen of *aciculum*, and apparently he overlooked Théel's excellent figures of *incompertus*,—the young *Urodemas perspicillum*,—which clearly show that both the *aciculum*-table and the *perspicillum*-table may occur in the same individual.

In view of these similarities the genus *Urodemas* has been amended so that it also takes in *Pseudocucumis aciculum* (Semper).

URODEMAS Selenka, 1867.

*Diagnosis.*—Stout, thick-skinned forms, length up to about 15 cm.; feet in crowded bands or also scattered in the interambulacra, with some tendency to be arranged in bands in young individuals; tentacles 20 in number, ten large, five slightly smaller and five much smaller ones distinctly set off from the 15 larger ones. Calcareous ring tubular, with long radials and interradials, with or without short posterior prolongations (the radials and interradials may be more or less deeply split); ring more or less soft and often the connection between the radials and interradials is concealed by the soft tissue; numerous free stone canals and Polian vesicles attached around the vascular ring; gonads developed as numerous long tubes in two tufts.

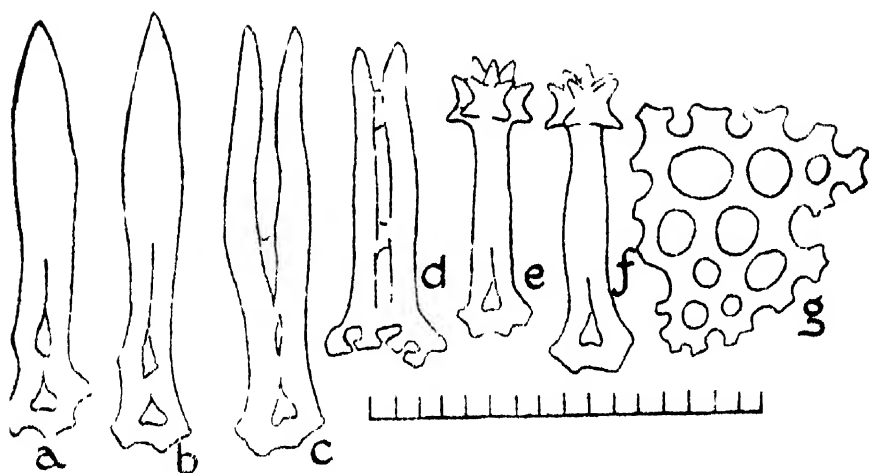
Spicules numerous as vertically placed rods, derived from tables with small disk and enormous spire in which the pillars usually have fused; spire ending in a smooth point or in a star-shaped cluster of spines; in one species the base of the table forms two diverging arms (? always). feet with end plate and smaller marginal plates; large supporting tables may be sparingly developed in some species (possibly a juvenile character, not reliable). Introvert with less modified tables with larger disk and shorter spire, often composed of two rods; tentacles with a varying number of rosettes and delicate slender rods, usually with perforated or forked ends.

*Type-species.*—*Urodemas perspicillum* Selenka.

*Remarks.*—The genus was established for a single species, from Port Jackson, Australia; unfortunately it was based on an aged individual with rather degenerate, reduced spicules. Later a smaller species was described from the same locality as *Phyllophorus incomptus*. Théel, and some doubt was expressed as to it being different from *perspicillum*.

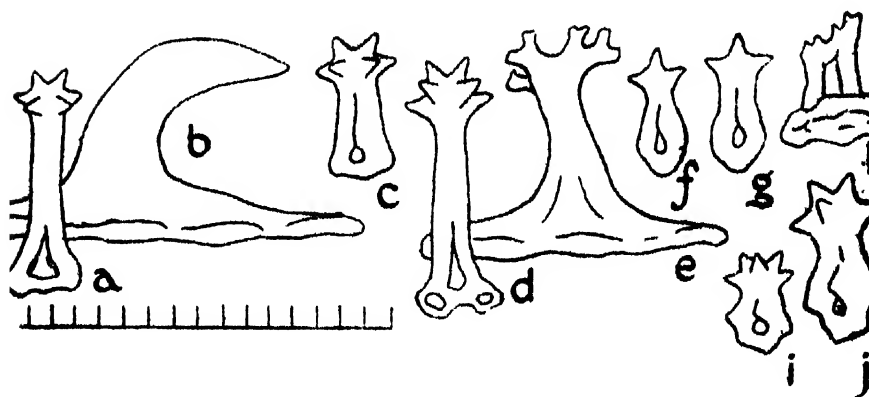
In 1867 Selenka referred two other species to *Urodemus*; both came from the Red Sea. One of these, *U. ehrenbergi*, has been referred to *Urodemella*, a new genus proposed

Fig. 2.



a-d, needle-like tables from *U. aciculatum*, from North Australia. e-g, tables from skin and plate from tube-foot, from 2 cm. long *U. schmeltzi*, from same locality

Fig. 3.



a-b, typical table and large supporting table from tube-foot from *U. hamatum*, from North Australia.

c-e, same from young *schmeltzi*, from same locality.

f-h, tables from aged *perspicillum*, from Port Jackson, Australia.

i-j, tables from aged *crassum*, from Hong Kong, China.

for *Phyllophorus holothurioides* Ludwig and *P. proteus* Bell: the other species has reduced spicules but may possibly represent a defective *ehrenbergii*, according to its calcareous ring.

The name *Urodemas* has been completely disregarded for many years until Heding re-instated it in 1934; four years later H. L. Clark redefined the genus and, furthermore, included in it *Thyonidium schmeltzii* Ludwig, *Phyllophorus hamatum* Sluiter and *Urodemas crassum* H. L. Clark (Hedings' "*perspicillum*" from Hong Kong).

The definition has now been amended so that *Pseudocucumis aciculum* also finds a place in the genus.

*Key to the Species of the Genus Urodemas Selenka, 1867.*

- |   |    |   |
|---|----|---|
| 1. Feet restricted to the ambulacra . . . . .   | 2. |   |
| 1. Feet numerous in the interambulacra, except in young individuals . . . . .   | 3  |   |
| 2. "Tables" with forked base and well-developed crown of spines. Known only from South Africa . . . . .   |    | [sp. nov.<br><i>Urodemas bifurcatum</i> , |
| 2. "Tables" with simple base; spire ending in a smooth point. Ranging from Mauritius to the Fiji Islands . . . . .  |    | [(Semper).<br><i>Urodemas aciculum</i>    |
| 3. Tube-feet with a few large supporting tables with low, hook-like spire; "tables" in skin rod-like, with well-developed crown of spines. Known from the East Indies and North Australia . . . . .   |    | [(Sluiter).<br><i>Urodemas hamatum</i>    |
| 3. Tube-feet rarely with a few large supporting tables and, if they are present, the spire is straight, branching . . . . .   | 4. |   |
| 4. Occasionally a few large supporting tables present in the feet; "tables" in skin similar to those found in <i>hamatum</i> . Known from North and West Australia . .  |    | [(Ludwig).<br><i>Urodemas schmeltzii</i>  |
| 4. No large supporting tables have as yet been found in the feet; "tables" in skin short, more degenerate than in the foregoing species, except in young individuals.   | 5. |   |
| 5. Mature specimens with short smooth "tables" with more or less rounded base and often the teeth poorly developed; young individuals have more typical spicules and some may also have some of the <i>aciculum</i> -type (viz., <i>incompertus</i> Théel). Known only from Port Jackson, Australia, possibly also Queensland (Bell). |    | [Selenka.<br><i>Urodemas perspicillum</i> |
| 5. Mature specimens with rough, angular to spinous spicules; immature individuals have so far not been examined; known only from Hong Kong, China. . . . .  |    | [H. L. Clark.<br><i>Urodemas crassum</i>  |

*Remarks.*—More detailed studies may finally prove that the four last species merely represent different stages of *perspicillum*. Aside from the large supporting tables found in *hamatum*, there is apparently nothing which separates this form from *schmeltzii* (which in some instances has been taken in the same localities as *hamatum* and occasionally has been discovered to have similar large tables although with erect spire). Conspicuous as these tables are they may quite well represent juvenile characters of most unreliable value, and it is not out of the question that they may be discovered in the young individuals of *perspicillum* and *crassum*. These two species were both based on aged individuals and both occur at the extreme limits of the area occupied by the genus, hence the deformation of the spicules finds a natural explanation. In case of *perspicillum* the young individual has been studied; it differs very little from *schmeltzii*, except in the presence of the *aciculum*-type of spicules among the normal ones.

As *Pseudocucumis* was established for *aciculum* alone, the name becomes a complete synonym of *Urodemas*. As for the heterogenous group of species which in the course of time has been referred to *Pseudocucumis*, not one belongs in *Urodemas* proper. These species have now been distributed as follows, using Engel's revision of 1933 :—

For *P. africanus*, a new genus is proposed, *Afrocucumis*, possibly Sluiter's *Phyllophorus transvectus* (1914) belongs in that genus too.

For *P. mixtus* Oestergren, a new genus is proposed, *Neopentadactyla*; its closest affinities seem to be with Hutton's old *Pentadactyla*, type-species *P. longidentis* (Hutton).

For *P. marioni* (v. Marenzeller), synonym *P. atlantica* Ludwig & Heding, 1935, a new genus is proposed. *Neocucumis*.

For *P. japonicus* Bell, *P. thomsoni* (Hutton), synonym *bicolumnatus* (Dendy & Creed), and *P. intercedens* Lampert, synonym *eurystichus* H. L. Clark, Bell's old genus *Amphicyclus* has been re-established, with Bell's species as the type-species.



Two species are rejected, namely, *P. quinquangularis* Sluiter, as it is a synonym of *Actinocucumis typicus* Ludwig, and *P. discrepans* Sluiter, a juvenile *Phyllophorus*, possibly *P. cebuensis*.

As incompletely known are listed *P. dactylicus*, *sagamiensis* and *uotasei*, all described by Ohshima from Japanese waters.

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The material upon which the description is based came from the South African Biological Survey. I beg Dr. T. A. Stephenson to accept my thanks for the opportunity to study this interesting form.

**LXIII.**—*Pleistocene Shrews from the larger Western Mediterranean Islands.* By DOROTHEA M. A. BATE, British Museum (Natural History).

#### INTRODUCTION.

The fossil remains of shrews described in this note were obtained from Pleistocene deposits situated in the four larger islands of the Western Mediterranean region: Mallorca and Menorca to the west and Corsica and Sardinia which form the western border of the Tyrrhenian Sea. The Mallorcan shrew remains were collected some years ago in a cave deposit on the east coast of the island (Bate, 1914*b*, p. 341, pl. xxv. fig. 1), and a little later I discovered the Menorcan specimens when exploring that island by means of a grant from the Trustees of the Percy Sladen Trust Fund, to whom I tender my sincere thanks for this assistance (Bate, 1914). When in Corsica in 1929 I was given two imperfect shrew skulls and a ramus from the cave Teppa di Lupino; besides this Dr. Kormos kindly lent me another skull. In 1927 I spent a short time working an outlying remaining section of the well-known deposit at Bonaria (Monreale) near Cagliari, southern Sardinia, where a number of shrew remains were found, nearly all of which are mandibular rami. These have been added to the specimens already in the British Museum, which formed part of Dr. Forsyth Major's Collection from the ossiferous breccia of Monte San Giovanni, south-west Sardinia, which also yielded remains of an extinct musteline genus, *Enhydrictis galictoides* (Major, 1901, and Pilgrim, 1933).

The two groups of islands, the Balearic group and Corsica and Sardinia, are now directly separated by sea with a minimum depth of 1000 fathoms, and the only connection by shallower seas is along the edges of the adjacent continents. It is probable that there has been no direct land connection between these island groups since their older faunal associations flourished. Inter-island isolation within these groups must also have lasted for some time since, in more than one instance, distinct races or species have arisen; examples of this are found in the different forms of *Myotragus* (Andrews, 1915) and

*Hypnomys* (Bate, 1919) from the deposits of Mallorca and Menorca, and of *Prolagus* (see Major, 1905) and *Nesiotites* (Bate, present paper) from Corsica and Sardinia. On the other hand, these groups of islands may have had connection with the mainland on more than one occasion during the Pleistocene. It has been suggested (Andrews, 1915, p. 30) that *Antelope melonii*, discovered in Sardinia by M. Déhaut (1911), might be a *Myotragus*, but since both its teeth and metapodials are unknown, both specific and definite generic identification are still awaited.

The Shrew remains described below represent an extinct genus, *Nesiotites*, which is a member of the older, if not the oldest, of the Pleistocene faunal complexes of the Mediterranean islands. This antiquity is established by the definite association in Menorca with the two extinct genera *Myotragus* and *Hypnomys*, as well as with remains of a gigantic tortoise (Bate, 1914a), which is not known to occur in late Pleistocene deposits in Europe. In Mallorca association with *Myotragus* is also known. The Sardinian species is believed to have occurred with the extinct *Enhydrietus*, and has been found with *Tyrrhenicola* and *Rhagamys* as well as *Prolagus*. I have so far, no definite knowledge of the faunal association of the Corsican species.

*Nesiotites* is the only shrew genus so far known to occur in the Pleistocene of the western Mediterranean islands, though it is not unlikely that this number may be increased when the fossil faunas of this area are better known. This generic scarcity is in striking contrast with what is known of the European Cromerian faunas which may not possibly have taken a share in supplying at least part of the earliest of the Island Pleistocene faunas. The Cromerian fauna of Europe is known to include seven shrew genera, a total which may be increased when a greater number of complete specimens are available for study and revision. Our knowledge of this considerable number is chiefly due to Dr. Kormos's sustained work and splendid discoveries in the Cromerian deposits of Hungary. The seven genera alluded to are :

*Beremendia.*

*Petenyia.*

*Sorex.*

*Neomys.*

*Soriculus.*

*Pachyura.*

*Crocidura.*

Two of these, *Beremendia* and *Petényia*, are extinct genera, and at the present day *Soriculus* is known only from central and eastern Asia. I have only a mandibular ramus with an imperfect condyle for examination, but think it not unlikely that the small *Soriculus kubinyii* from Hungary may also eventually prove to represent an extinct genus.

Compared with the above the present-day shrew population of Europe is an impoverished one, and includes only four genera, if we exclude Dr. Altobello's *Soricidus* (1928) which, from the examination of a skull kindly lent me by the author, seems to be an aberrant species of *Sorex*. The four genera are: *Sorex*, *Neomys*, *Pachyura* and *Crocidura*. The Recent shrews of the Mediterranean islands, like many other groups, emphasize the immense difference that separates the Pleistocene from the Recent faunas. The following table of the shrews of the Mediterranean islands clearly shows this difference in the western area. With regard to the central and eastern area it must be remembered that, although the remains obtained appear to represent *Crocidura*, no specimens sufficiently complete for specific identification have yet been obtained.

	Pleistocene.	Recent.
Mallorca .....	* <i>Nesiotites hidalgo</i> .	<i>Crocidura balearica</i> .
Menorca .....	* <i>N.</i> (?) <i>hidalgo</i> .	
Corseica .....	* <i>N. corsicanus</i> .	<i>Crocidura cyrenensis</i> .
Sardinia .....	* <i>N. similis</i> .	<i>Pachyura etrusca</i> .
Malta .....	? <i>Crocidura</i> sp.	<i>Crocidura ichnusae</i> .
Gozo .....	—	<i>Pachyura etrusca</i> .
Sicily .....	? <i>Crocidura</i> sp.	<i>Crocidura ruscula</i> .
Crete .....	? <i>Crocidura</i> sp.	<i>Pachyura etrusca</i> .
Cyprus .....	? <i>Crocidura</i> sp.	<i>Crocidura sicula</i> .
		<i>C. caudata</i> .
		<i>Crocidura canes</i> .
		<i>C. cypria</i> .

It is interesting, though not unexpected, to find that the extinct genus of shrews described below shows most affinity with some Asiatic forms; this connection may not be very close, but it serves to accentuate the general

Eurasian aspect of the Pleistocene mammalia of the Mediterranean islands. While African types seem to be almost entirely wanting, a few elements are shared, for instance *Ursus*, which is known rarely from Malta and Corsica, may have reached the northern coastal strip of Africa from Europe through Syria and Palestine, and perhaps also by the more direct crossing from Malta or Sicily as suggested by earlier writers, and more recently by Dr. Trechmann (1938, p. 5).

Dr. Merriam (1895, pl. vi.) has published some instructive drawings showing the great alterations which take place in the teeth of shrews during the course of wear. Among the features shown are the total loss of denticles on the upper border of the lower incisor, and the disappearance of pigmentation due to the wearing away of the tips of the teeth. Throughout my study I have sought to make observations and comparisons of unworn teeth when available, and of specimens in a similar condition of wear. Very careful comparisons have been made with all available relevant specimens and descriptions of fossil forms, and with numerous Recent species. It was thought at first that perhaps the Recent *Chimarrogale* group might be descended from *Nesiotites*, but the skull differences are so constant that it is more likely that the two are descendants of a common stock.

For convenience I have used the term unicuspid to designate the small teeth lying between the large anterior upper incisor and the molariform premolar, and between the large lower incisor and *M*<sub>1</sub>, although these teeth frequently possess more than a single cusp. Particularly in view of Professor Stehlin's recent discoveries and descriptions (1940) it seems that the homologies of these small teeth are not yet fully understood.

#### NESIOTITES, gen. nov.

*Diagnosis*.—An extinct genus of shrews of medium size, generally larger than Recent European species. Skull with deep snout, rounded and narrow dorsally, inter-orbital area long, anteorbital foramen moderately large, and conspicuously visible when the skull is viewed from above. Antero-posterior length of bony bridge over the

infraorbital canal noticeably short, comparatively shorter than in *Soriculus nigrescens*, *Chimarrogale himalayica*, *Neomys fodiens* or *Beremendia fissidens*. Maxillary region broad, comparatively broader than in Recent *Soriculus* or *Chimarrogale*, zygomatic process of maxillary well developed. Viewed from above the cranium is seen to expand abruptly immediately behind the interorbital area, its border at first formed by the dorsal edge of the upper postglenoid process much as in Recent *Neomys* and *Chimarrogale*. Pterygoids long and almost parallel, the mouth of the foramen ovale lies behind the glenoid cup, as in *Neomys*, *Chimarrogale* and *Soriculus*. Ramus with coronoid low, angle of medium length, and area connecting the two articulating facets of the condyle narrow, lower facet produced linguallly much as in *Chimarrogale* and *Neomys*. Teeth more or less coloured with yellowish or reddish brown pigment, or colour may be absent. Large upper anterior incisors bifid, less pro-odont than in Recent *Neomys* or *Soriculus*, with points strongly divergent as in *Beremendia*; viewed laterally the hinder cusp is shorter antero-posteriorly than each of the three anterior upper unicuspid. Upper and lower unicuspid. more primitive, generally with larger, and sometimes more numerous, internal tubercles than in Recent species. Upper unicuspid. 3 to 4 in number, the anterior one usually slightly larger than the second, the third slightly the smallest. When present the fourth upper unicuspid is minute, single rooted, with a peg-like crown, as in Recent *Soriculus*. The three anterior upper unicuspid. generally noticeably large, with the anterior portion of each resting on the tooth in front. Crown pattern of  $pm^4$  and  $M^{1-3}$  as in *Sorex*. Large lower incisor stout with tip strongly upturned one or two lobes on upper border; a slight cingulum may be present at the external base of the crown.  $M_3$  comparatively larger than in Recent *Chimarrogale* or *Soriculus*. Humerus not specially modified for an aquatic or a burrowing mode of life.

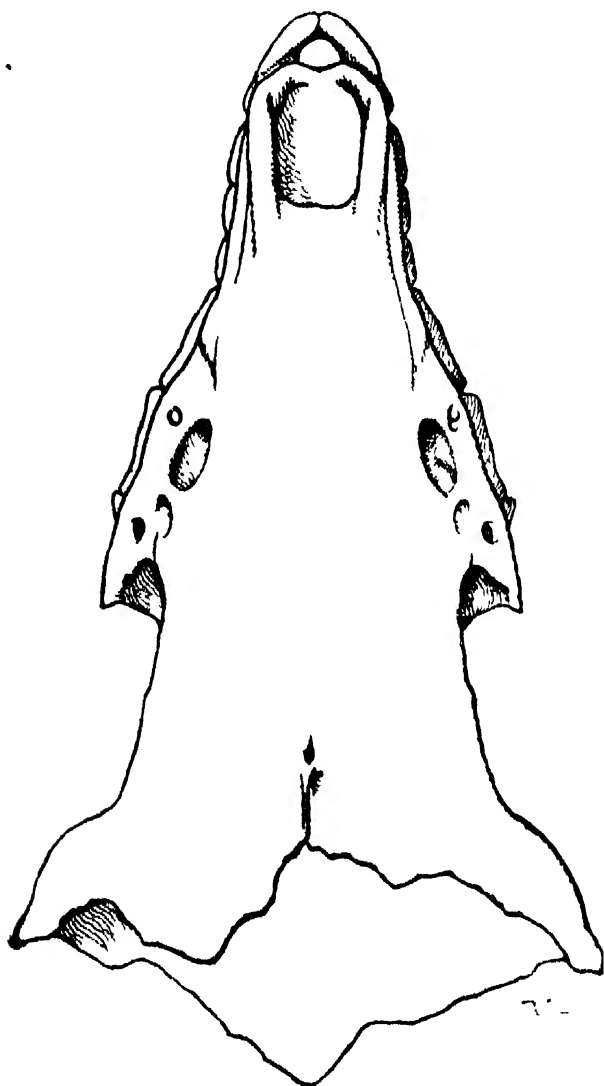
*Genotype*.—*Nesiotites hidalgo*, sp. n.

*Nesiotites hidalgo*, sp. n. (Figs. 1, 2, 3b, 4a, 5a.)

*Diagnosis*.—Skull about the size of that of *Chimarrogale himalayica*, but upper and lower anterior incisors

smaller and  $M_3$  broader. Three upper unicuspid known, teeth slightly coloured with yellowish brown; a median

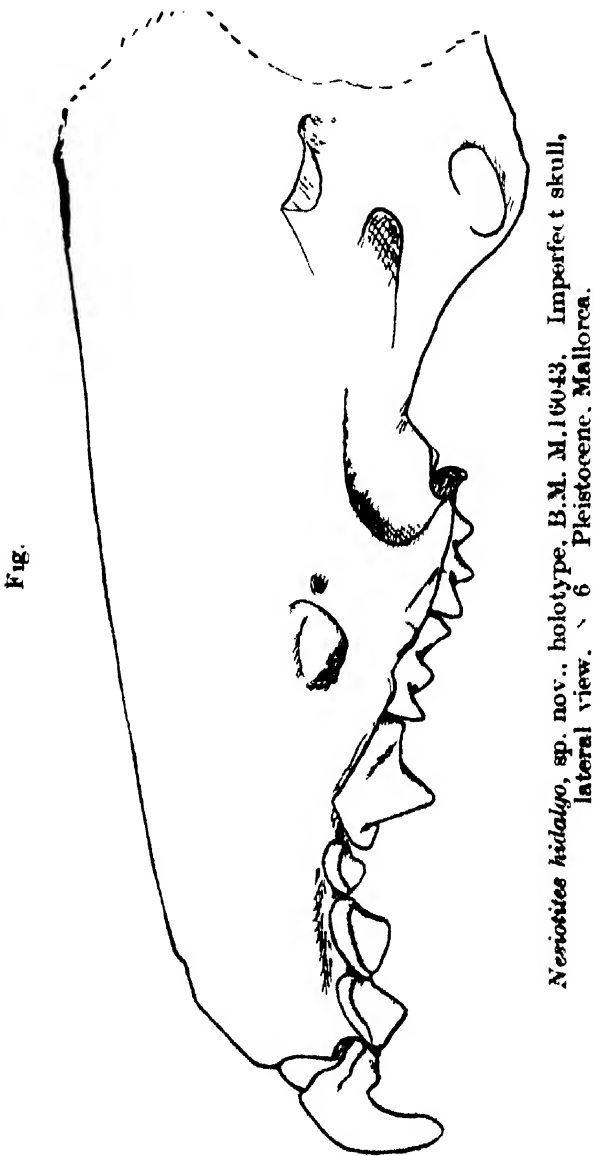
Fig. 1.



*Nesiotites bidalgo*, sp. n., holotype. B.M. M16043; dorsal view of imperfect skull,  $\times 6$ . Pleistocene, Mallorca.

internal tubercle present in second lower unicuspid. Condyle of ramus stout, stouter than in *N. corsicanus*. Other characters as for genus.

*Holotype*.—The anterior portion of a skull, with complete dentition, from a cave deposit, Cap Faruch, Eastern Mallorca. Brit. Mus. M16043, figs. 1, 2, and 4a, 5a.



*Paratypes*.—A left mandibular ramus with complete dentition. Brit. Mus. M16044, fig. 3b, and an imperfect left mandibular ramus with the posterior unicuspid

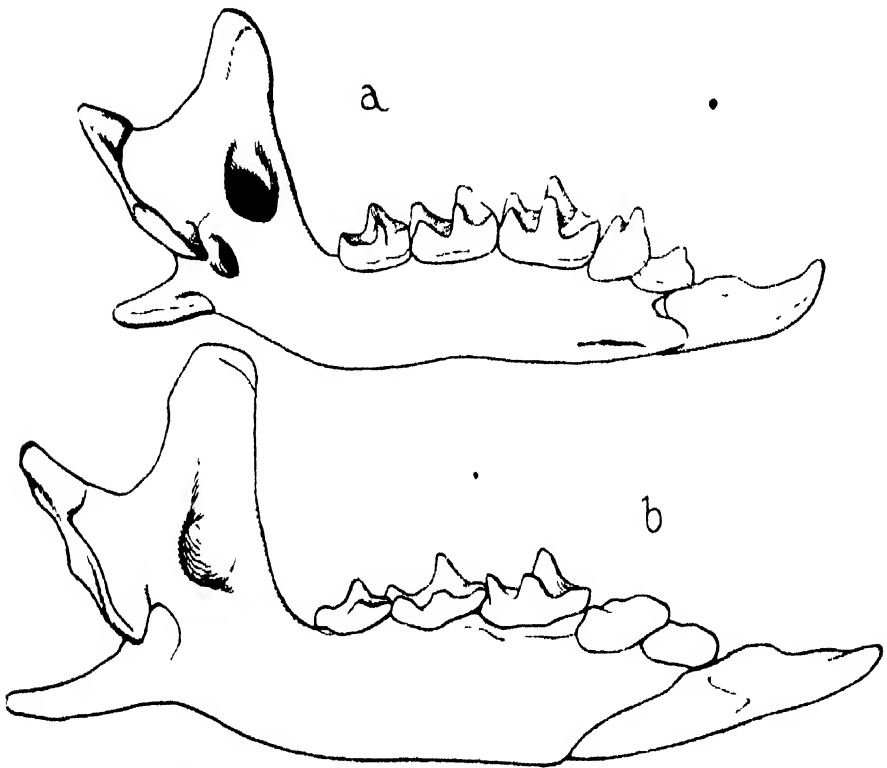


and  $pm_4$ , M16045, both from the type locality. No other specimens are so far known.

*Locality and horizon.*—Mallorca; Pleistocene, known from a cave deposit in the Jurassic limestone of Cap Faruch, Eastern Mallorca, and situated only a few feet above sea-level (Bate, 1914 *b*, pl. xxv. fig. 1).

*Associated fauna.* Associated with the extinct antelope *Myotragus balearicus*.

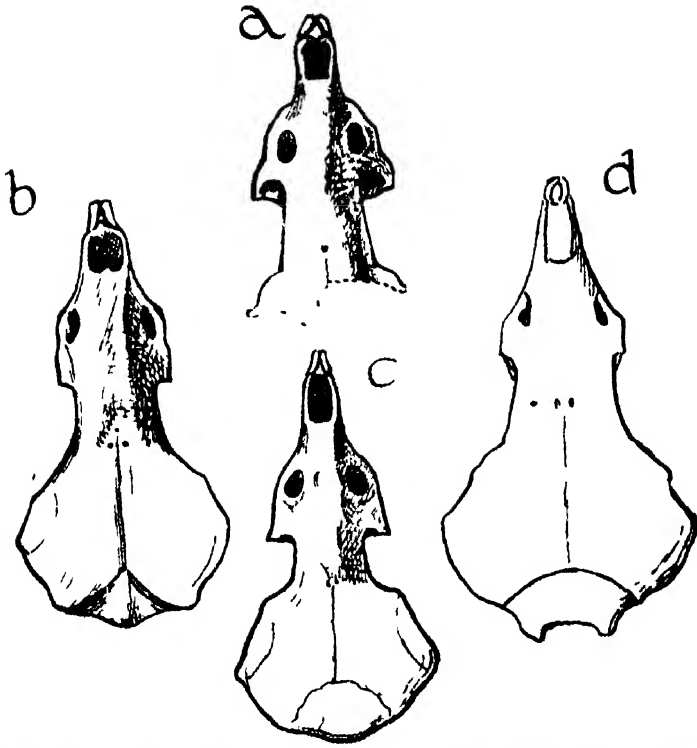
Fig. 3.



- a. *Nesiotites senilis* (Hensel). B.M. M16058; left mandibular ramus, internal view,  $\times 6$ . Pleistocene, Sardinia.  
b. *Nesiotites hidalgo*, sp. n. B.M. M16044; left mandibular ramus  $\times 6$ . Pleistocene, Mallorca.

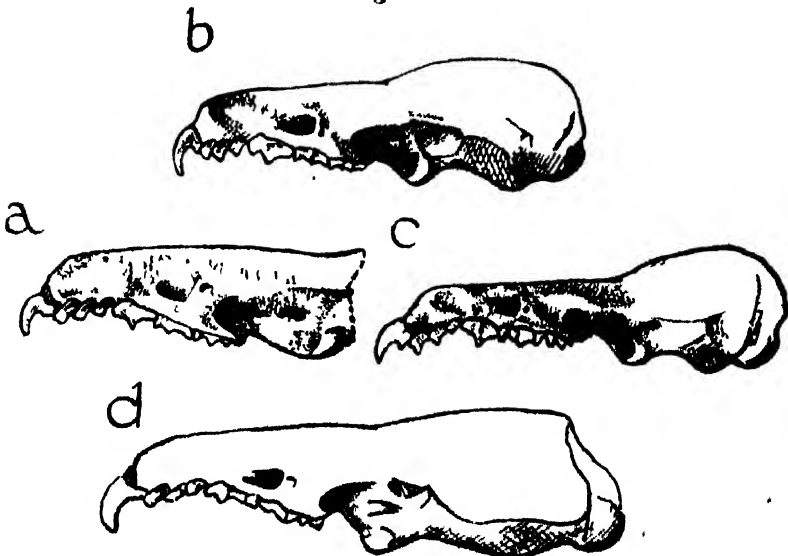
*Distribution.*—The island of Mallorca, and perhaps also Menorca.

*Remark.*—The holotype skull is in a very good state of preservation, though unfortunately the teeth are considerably worn, which makes a close comparison with the almost unworn teeth from Menorca impossible.



- a. *Nesiotites hidalgo*, sp. n., holotype. B.M. M16043; dorsal view of skull,  $\times 2$ .  
 b. *Soriculus nigrescens*, Recent skull, dorsal view,  $\times 2$ .  
 c. *Neomys fodiens*, Recent skull, dorsal view,  $\times 2$ .  
 d. *Chimarroale himalayica*, Recent skull, dorsal view,  $\times 2$ .

Fig. 5.

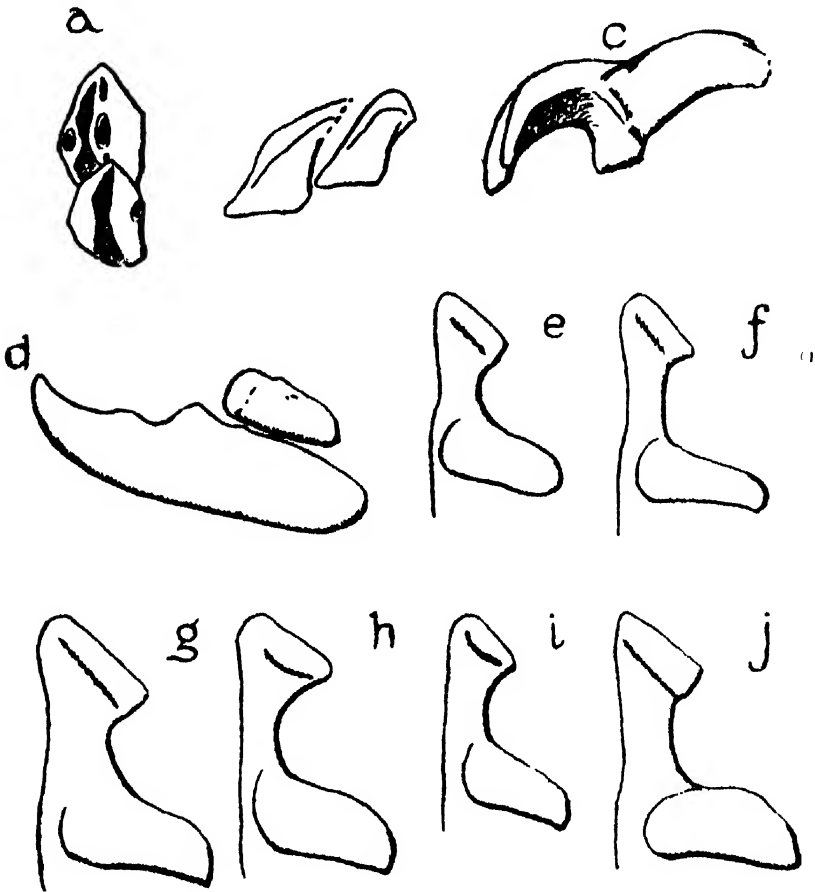


- a. *Nesiotites hidalgo*, sp. n., holotype. B.M. M16043; lateral view of skull,  $\times 2$ .  
 b. *Soriculus nigrescens*, Recent skull, lateral view,  $\times 2$ .  
 c. *Neomys fodiens*, Recent skull, lateral view,  $\times 2$ .  
 d. *Chimarroale himalayica*, Recent skull, lateral view,  $\times 2$ .

*Nesiotites* (?) *hidalgo* from Menorca. (Figs. 6a-d, 8a, b.)

About a dozen specimens representing *Nesiotites* were obtained from fissure deposits in the Miocene limestone

Fig. 6.



- a. *Nesiotites* (?) *hidalgo*, B.M. M16049; upper second and third unicuspid, crown view,  $\times 12$ . Pleistocene, Menorca.
- b. *N.* (?) *hidalgo*, side view of same specimens.
- c. *N.* (?) *hidalgo*, B.M. M16051; right upper incisor, internal view,  $\times 8$ , *ib. loc.*
- d. *N.* (?) *hidalgo*, B.M. M16050; large lower incisor and unicuspid, external lateral view,  $\times 8$ , *ib. loc.*
- e. *Neomys fodiens*, Recent, condyle of ramus,  $\times 8$ .
- f. *Soriculus nigrescens*, Recent, condyle of ramus,  $\times 8$ .
- g. *Nesiotites hidalgo*, Pleistocene, Mallorca, condyle of ramus,  $\times 8$ .
- h. *N. corsicanus*, Pleistocene, Corsica, condyle of ramus,  $\times 8$ .
- i. *N. similis*, Pleistocene, Sardinia, condyle of ramus,  $\times 8$ .
- j. *Chimarrogale himalayica*, Recent, condyle of ramus,  $\times 8$ .

of Menorca (Bate, 1914b), but these are generally fragmentary since they were embedded in an extremely hard

red breccia from which it was difficult to extricate them. The teeth are pigmented, and since most of them are less worn than in the three known specimens from Mallorca, it has not yet been possible to ascertain whether the shrews from the two Balearic Islands are specifically identical or not. It may be remembered that different forms of *Myotragus* and *Hypnomys* lived in these two islands.

In neither of two imperfect skulls is there any trace of a fourth upper unicuspid. Two scarcely worn upper second and third unicuspid (M 16049) are shown in lateral view (fig. 6b) and also in crown view (fig. 6a). The latter figure shows the prominence of the internal median tubercle and of the whole internal area of the crown. In several specimens a median internal tubercle is also present in the hinder lower unicuspid, and two examples of this tooth in slightly different stages of wear, are shown in figs. 8a M16070 and 8b M16055. This character can also be seen in *N. hidalgo*, but does not seem to occur in *N. similis*. The presence of this tubercle is believed to be a primitive character, and is one that I have not observed in Recent *Neomys*, *Soriculus* or *Chimarrogale*. A slightly worn large lower incisor (fig. 6a, M16050) shows two distinct cusps on the external edge of its dorsal border; the maximum length of the crown is 4.8 mm. The Menorcan specimens were associated with remains of *Myotragus*, *Hypnomys* and of a gigantic tortoise, *Testudo gymnesicus*.

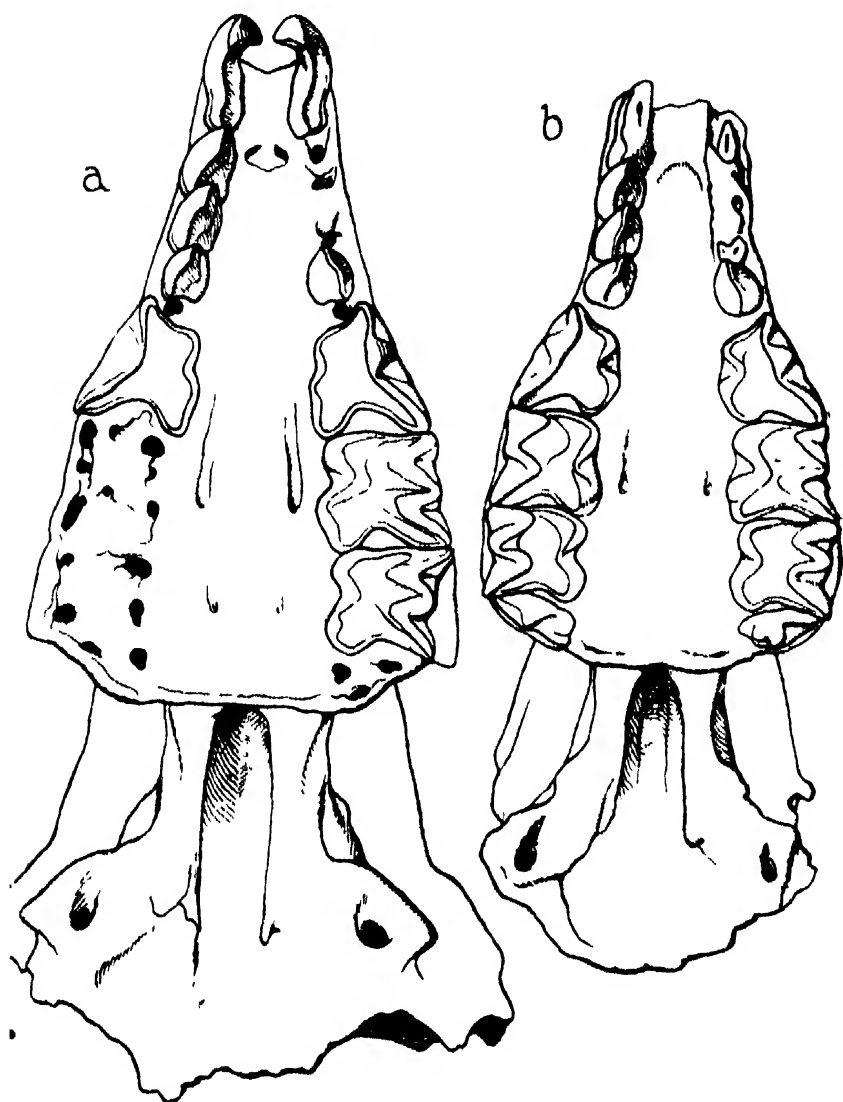
*Nesiotites corsicanus*, sp. n. (Figs. 6h, 7a.)

*Diagnosis.*-- A *Nesiotites* slightly smaller than *N. hidalgo*, with rather shorter snout. Teeth tipped with pale reddish brown, four upper unicuspid present, the fourth small, single rooted; the three anterior upper unicuspid comparatively smaller than in *N. hidalgo*, their combined length, and also their individual width is less. Articular facets of condyle of ramus more slender than in *N. hidalgo*, other skull characters as for genus.

*Holotype.* - The anterior portion of a skull with large upper incisors, three unicuspid of right side, the alveolus of the fourth unicuspid,  $pm^4$  and  $M^{1-2}$  of the left side,  $M^3$  lacking. From the cave Teppa di Iapino, North Corsica (M16046, fig. 7a).

*Other specimens examined.*—An imperfect skull with second and third unicuspid and  $pm^4$  and  $M^{1-2}$  (M16047) and a mandibular ramus with the large incisor and  $M_1$

Fig. 7.



a. *Nesiotites corsicanus*, sp. n., holotype. M16046; palatal view of skull,  $\times 6$ . Pleistocene, Corsica.  
b. *N. similis*, M16059,  $\times 6$ . Pleistocene, Sardinia.

(M16148, fig. 6b), both from Teppa di Lupino: also an imperfect skull lent me by Dr. Kormos.

*Locality and Horizon.*—Corsica: Pleistocene. Dr. Tobien (1935, pp. 259–260) records this species under the name *Soriculus similis* (Hensel), from four cave deposits in the north of the island: these localities are apparently taken from labels on Dr. Forsyth Major's specimens in the Natural History Museum, Bâle.

*Associated Fauna.*—I have no personal knowledge of the species associated with *N. corsicanus*, though it seems likely that it was a contemporary of *Ithagomys* and other extinct forms. Following Joleaud, Dr. Tobien (1935, p. 266) includes the Corsican and Sardinian Shrews in the earliest of three Pleistocene faunal phases of Corsica and Sardinia.

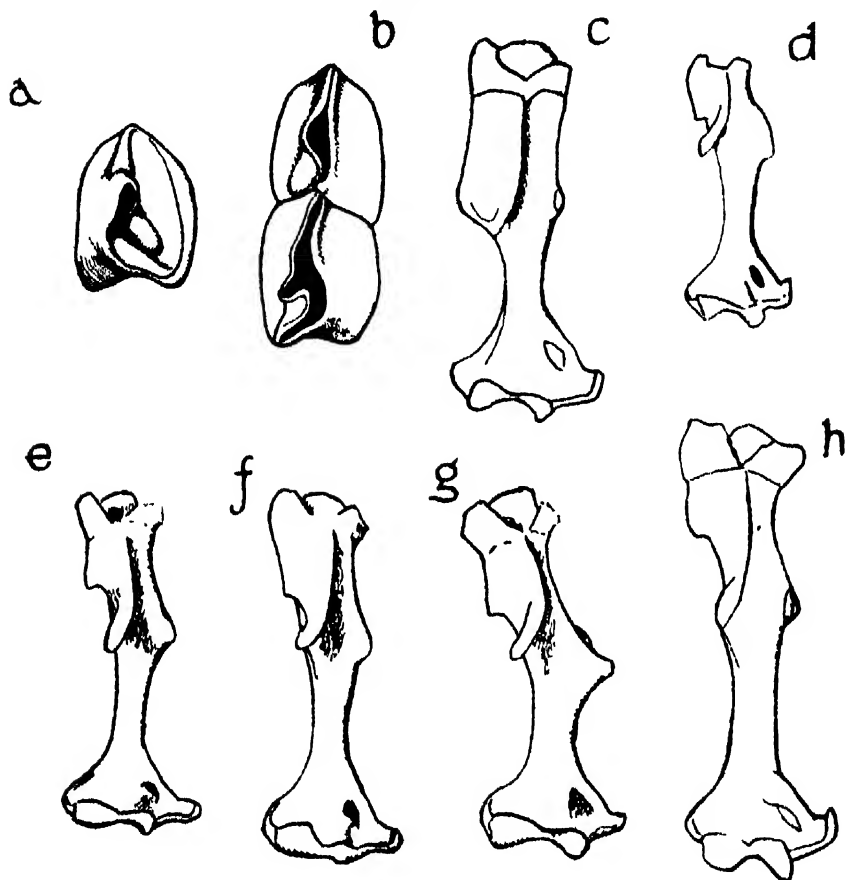
*Remarks.*—Although this species does not differ very much in size from *N. hidalgo* it is easily distinguished by the presence of a fourth upper unicuspid, and by the distinctly smaller size of the three anterior unicuspids. So far as I am aware this shrew has not been previously described, though it has been referred to under the name of *Soriculus similis* (Hensel) by several authors (see historical section). Depéret (1897) does not include a Shrew in his list of Pleistocene mammals from Corsica, and it seems possible that *N. corsicanus* was first collected by Dr. Forsyth Major.

*Nesiotites similis* (Hensel). (Figs. 3a, 6i, 7b, 8f.)

*Diagnosis.*—A *Nesiotites* distinctly smaller, and with snout, interorbital area and pterygoids comparatively shorter than in *N. corsicanus*. Size about that of *Chimarrogale styani*. Teeth tipped with reddish brown, three, or four, upper unicuspids, when present the fourth is a tiny single-rooted tooth with peg-like crown, and it is pressed inwards between the two neighbouring teeth.  $M_3$  comparatively slightly narrower than in *N. hidalgo*, postero-internal tubercle of hinder lower unicuspid absent, or only faintly developed, large lower incisor short and stout with abruptly upturned tip. The bony bridge over the infraorbital foramen may be actually wider than in *N. hidalgo* or *N. corsicanus*. Other skull characters as for genus. Humerus not specially modified for an aquatic nor for a fossorial mode of life.

*Specimens examined.*—Four anterior portions of skulls, two maxillæ with teeth, a large upper anterior incisor with the two anterior unicuspid, more than forty-five rami, six humeri and three femora. The tiny peg-like fourth

Fig. 8.



- a. *Nesiotites* (?) *hidalgo*, M16070; posterior lower unicuspid, crown view,  $\times 12$ . Pleistocene, Menorca.
- b. *N.* (?) *hidalgo*, M16055; lower unicuspid, crown view,  $\times 12$ , *ib. loc.*
- c. *Anourosorex assamensis*, Recent, right humerus,  $\times 4$ .
- d. *Sorex araneus*, Recent right humerus,  $\times 4$ .
- e. *Neomys fodiens*, Recent, right humerus,  $\times 4$ .
- f. *Nesiotites similis*, Pleistocene, Sardinia, right humerus,  $\times 4$ .
- g. *Soriculus nigrescens*, Recent, right humerus,  $\times 4$ .
- h. *Chimarrogale himalayica*, Recent, right humerus,  $\times 4$ .

upper unicuspid is present in only two of the six specimens with upper dentition.

*Locality and Horizon.*—Sardinia: Pleistocene. This species has been recorded from a number of deposits in the island: the specimens in the British Museum are from Monte San Giovanni (Major Coll.) and from the deposit at Bonaria near Cagliari (Bate Coll.) which is situated at about 200 feet above sea-level.

*Associated Fauna.*—At Bonaria I found remains of *N. similis* associated with those of *Prolagus sardus*, *Tyrrenicola henseli*, *Rhagamys orthodon*, *Cuon sardous* and *Cervus* sp., that is with three extinct genera and an extinct species. Monte San Giovanni, from which Dr. Forsyth Major's specimens came, is the locality where he obtained *Euhydricis galictoides*.

*Remarks.*—It has seemed advisable to make a fresh diagnosis of the Sardinian Pleistocene shrew, since there was no skull among the specimens examined by Hensel, and which he only compared with Recent European species. He founded his species (1855, p. 45, pl. 25, fig. 1) on an imperfect left mandibular ramus retaining the large incisor and the three molars, and referred to the stout incisor with its proximal portion gradually rising, but with its tip conspicuously upraised. He further says that the molars are not substantially different from those of *Sorex* [*Neomys*] *fodiens*, which the fossil surpasses in size. I may add that the large lower incisor of the fossil is not only stouter but is actually a shorter tooth than that of *N. fodiens*. The teeth of the available specimens from Sardinia are more strongly pigmented than those I have seen of the other species of *Nesiotites*, or those of any known species of *Chimarrogale*.

*Nesiotites similis* is the only species of the genus of which the limb bones are known, and the British Museum Collection includes four humeri and three femora which are well preserved. In lateral view it is seen that the upper portion of the humerus, from about midway along the deltoid crest, is bent slightly backwards, much as in Recent *Sorex araneus*, but less so than in Recent *Neomys*. The anterior view of a right humerus of *N. similis* is shown in fig. 8f, M16060; this bone has a maximum length of 9·5 mm., and is straight with a narrow cylindrical shaft having a minimum diameter of 1 mm. A complete femur has a maximum length of 11·5 mm. The following table



gives a few measurements in millimetres, taken from specimens described above :—

	<i>V. hidalgo</i> , Mallorca.	<i>N. e hidalgo</i> , Menorca.	<i>N. corsicanus</i> .	<i>N. similis</i> .
Palatal length* . . . . .	11		10·2	—
Palatilar length* . . . . .	10·1	9·5	9·1 9·4	8·3
Length $pm^4 - M^1$ . . . . .	6·6	6·6		5·7
Length of three anterior upper unicusps . . . . .	3·3	—	2·9	2·5
Length of $pm^4$ . . . . .	2·4	2·3	2·2	2
Length of external border of $M^1$ . . . . .	1·9	2	1·9	1·8
Maximum width of $M^1$ . . .	2·4	2·5	2·3	2·1
Length lower tooth row, excluding large incisor . . . .	7·7		—	6·8-6·9

\* See Thomas, 1905.

#### HISTORICAL.

The shrew remains from the Balearic Islands are here described for the first time, but the Sardinian species, *Nesiotites similis*, is distinguished as the first fossil shrew to be recorded scientifically. This discovery, first published in 1823, was due to Cuvier (see 1825, iv. p. 206), who describes how in a small piece of bone breccia from a deposit near Cagliari he found, besides remains of a Vole and a *Prolagus*, three upper cheek teeth and a humerus of a shrew. These he figured (*op. cit.*, pl. 15, figs. 27 and 28), and mentions that the teeth were tipped with orange and were the size of those of *Sorex* [*Neomys*] *fodiens*.

After giving a good description of the ossiferous deposit at Montereale near Cagliari, Wagner (1828, p. 16), records the remains of a *Sorex* which he says is larger than the Common Shrew and about the size of the Water Shrew. Later this author described and figured several specimens (1832, p. 760, figs. 2-46) from the same deposit, and he accepted Cuvier's view that these showed most resemblance to *Sorex fodiens*, without being completely the same. Blainville (1840, ii. p. 98, pl. xi.) also described and figured several fragmentary specimens, and reached a similar conclusion to that arrived at by Cuvier and Wagner.

Somewhat later Hensel (1855) re-examined the specimens already studied by Wagner, gave a more detailed description, and decided that the Sardinian fossil shrew was distinct from the Recent Water Shrew, and he therefore gave it the name *Sorex similis*. In his description of animal remains from the well-known deposit near Cagliari, Studiati (1857) does not appear to have been aware of Hensel's work, and he merely describes, without figuring, a few specimens which he attributes to *Sorex*. In a list of species from Bonaria and other deposits Dr. Forsyth Major (1883, p. 6) included "*Sorex affinis* Hens.", but this was no doubt in error for *S. similis* Hensel.

Recently published mention of the Pleistocene shrews of Corsica and Sardinia has been made under the name *Soriculus similis* (Passemar, 1925, p. 348; Kormos, 1926, p. 386, and 1934, p. 303; Tobien, 1935, and Vaufreys, 1929, with a query). So far as I am aware no reason has been given for their inclusion in this genus, although Dr. Passemar (1925) seems to suggest that he had Dr. Forsyth Major's authority for this procedure. Light is thrown on this question by some labels in the British Museum (Natural History) and in the Natural History Museum, Fâle. Dr. Major had a well-known habit of making notes on labels, and I have before me an old label attached to a tablet on which are several specimens representing the Sardinian shrew, which had originally been marked officially in ink *Sorex similis*. The generic name had subsequently been scored through in pencil and the name *Neomys* substituted in Dr. Major's handwriting. This in turn he had pencilled through and replaced by *Soriculus*. Dr. Schaub tells me in a letter that similar alterations have been made on labels in the Bâle Museum. It is evident that Dr. Major appreciated the fact that the Sardinian Shrew did not belong to either *Sorex* or *Neomys*, but he had not completed his investigations, therefore this identification with *Soriculus* cannot be considered a studied opinion, and I believe that the name *Soriculus* was never used by him in print for this species.

The name *Soriculus similis* seems to have been applied to the Pleistocene Corsican shrew, not on osteological evidence but on account of the neighbouring geographical position of Corsica and Sardinia; this assumption of

identity has not been borne out by a close study of actual specimens.

#### COMPARISONS AND CLASSIFICATIONS.

*Comparison with fossil forms.*---Remains of several species of shrews are known from European Tertiary deposits ; for instance, Professor Stehlin (1940) has given a most interesting description of *Saturninia gracilis* from the Eocene of France. This early form has six upper unicuspid, five lower ones, and two lower incisors in the larger of which the crown is only slightly prolonged and has several tubercles. A few species are known from Oligocene and Miocene deposits (see Viret, 1929; Depéret, 1892), but the specimens are usually fragmentary. Probably the best known is *Sorex antiquus*, which already shows a reduction in the number of teeth (Stehlin, 1940, figs. 1-4) ; as in Recent *Sorex* it has five upper unicuspid, but in the lower jaw there is a small third unicuspid, one more than in Recent *Sorex*. It may not be out of place to mention that a third lower unicuspid may occur in the Recent *Myosorex* (Dobson, 1890, p. 25, fig. 1). An interesting Shrew has been described from the Oligocene of North America ; this is *Protosorex crassus*, which has only four upper unicuspid, but in the mandible has "four minute teeth between the molars and the large procumbent incisors." (Scott, 1895.)

The trend towards a numerical reduction of the teeth, particularly in the unicuspid, has shown itself many times in different groups of shrews, consequently this character does not in itself prove a close relationship between one form and another. *Amblycoptus oligodon* from the Pontian of Hungary, discovered and described by Dr. Kormos (1926), combines primitive characters with a reduction of both unicuspid and cheek teeth which has gone further than in most Recent genera ; it has three upper unicuspid, and in the lower jaw two unicuspid with only two molars.

European early Pleistocene deposits have yielded remains of several red-toothed Shrews. A few belonging to the genera *Sorex* and *Neomys* are known from England (Hinton, 1911) and these, together with additional species have also been recorded and described from Cromerian deposits in caves in Bavaria (Heller, 1930 and

1936, Brunner, 1933): these are generally known from mandibular rami only. Two species have also been notified from Hundsheim, Lower Austria (Kormos, 1937). As already mentioned, the Cromerian deposits of Hungary have yielded remains of a number of Shrews referred to no fewer than six genera, two of which are extinct. Dr. Kormos (1934, p. 303) considered that the tiny *Soriculus kubinyi* was related to both the Recent *S. nigrescens* and to the Corsican and Sardinian Pleistocene shrews, but this is unlikely to be true in each case. Another small shrew from the Cromerian of Hungary and Germany is *Petenyia hungarica* (Kormos, 1934, p. 301, and Heller, 1936), represented in the British Museum collection by a complete mandibular ramus and two fragments (M14019). The characters of these specimens indicate no close connection with *Nesiotites*; the anterior lower unicuspid is already more reduced than that of *Nesiotites*, and the shape of the condyle of the ramus and the very dark staining of the teeth suggest possible affinities with *Sorex*.

The large and stout *Beremendia fissidens*, of which I have a number of specimens for comparison, is known from the Cromerian of Hungary and Germany (Kormos, 1934; Brunner, 1933; Heller, 1930, 1936). This shrew seems invariably to have a fourth upper unicuspid which is less reduced in size than this tooth when present in *Nesiotites*; on the other hand, both  $M^3$  and  $M_3$  are comparatively more reduced in *Beremendia* than in *Nesiotites*, and its large lower incisor appears to have lost all tubercles on its upper border. There are resemblances as well as marked differences between these two genera, but the specialized characters of *Beremendia* just referred to preclude a direct linear relationship, though there may be some connection between the groups which *Beremendia* and *Nesiotites* represent.

Not much is known of fossil Shrews from Asia; a few have been described from the late Tertiary of Mongolia (Schlosser, 1924, and Miller, 1927) though as yet little is definitely known of these species. A *Neomys*, *N. sinensis*, has been recorded by Dr. Zdansky (1928) from Loc. 53 (? Sanmenian) of Choukoutien, and another species, *N. bohlini*, by Dr. C. C. Young (1934) from Loc. 1 of the same cave. These were described from mandibular rami,

and Dr. Pei (1936, p. 20) is wise in suggesting caution in connection with generic determinations until more complete specimens are obtained. Species of *Sorex* and *Crociodura*, *C. wongi* (Pei, 1936), from Choukoutien Loc. 3 seem to be determined with greater certainty. None of these species, as so far described, suggest any close relationship with *Nesiotites*.

*Comparison with Recent forms.*—In view of the fact that *Nesiotites similis* from Sardinia has at different times been placed in more than one Recent genus (see historical section), I have most carefully compared the Pleistocene Shrews of the Western Mediterranean Islands with a large number of Recent genera and species from Europe and Asia, also with some from North America. As a result of this it appears that the Recent Asiatic group, which includes *Chimarrogale*, *Crossogale* and *Nectogale*, is the only one with which *Nesiotites* shows any close affinity, and some of the resemblances, as well as differences, will be noted below.

*Sorex* was the generic name first applied to *N. similis*, but this was at a time when the terms *Sorex* and red-toothed shrews were synonymous. There are outstanding differences: for instance, *Sorex* has a greater number of unicuspid, differently coloured teeth, the position of the mouth of the foramen ovale is unlike, and the shape of the condyle of the ramus quite distinct.

*Neomys.* *Nesiotites* may be distinguished from Recent *Neomys* by a number of important characters—for example, the rostrum in *Nesiotites* is deep, narrow and rounded dorsally, whereas in *Neomys* it is low and flat dorsally (fig. 5 c). The fossil genus has gone further in the reduction in the number of the upper unicuspid, and when present its fourth unicuspid is more reduced in size than that of *Neomys*. The size and form of the upper unicuspid are quite different in the two genera; those of the fossil genus are comparatively larger, and lack the prehensile character so typical of this Recent genus (fig. 5 c). The different shape and extra tuberculation of the large lower incisor in the fossil genus also separate it from the Recent *Neomys* (fig. 6 d).

*Soriculus.*—Viewed from above some of the outstanding and constant differences between the skulls of *Nesiotites* and Recent *Soriculus* can be clearly seen (fig. 4). Notice-

able in the fossil genus are the great maxillary width and prominent zygomatic processes, the sudden expansion of the brain case immediately behind the interorbital area, and the large anteorbital foramen. *Nesiotites* had already progressed slightly further in the suppression of the upper unicuspid than has *Soriculus*, which seems invariably to possess a small fourth unicuspid;  $M^3$  and  $M_3$  are comparatively larger teeth in the fossils. The shape of the humerus in the two genera shows considerable difference, suggesting dissimilar habits (figs. 8 f & g).

*Chimarrogale*.—In its skull and dentition *Nesiotites* shows greater resemblance to the Recent *Chimarrogale*, and particularly *C. himalayica*, the Himalayan Water Shrew, than it does to any other species with which I have been able to make comparisons. This is seen, for instance, in the shape and the comparatively large size of the upper unicuspid, and in the generally slight pigmentation of the teeth. There are, however, a number of constant differences which distinguish the two genera; in *Nesiotites* the snout is deep and dorsally narrow, whereas in *Chimarrogale* it is generally low, and wide and flat dorsally (figs. 1, 2); in *Nesiotites* the interorbital area and the pterygoids are comparatively larger, the zygomatic processes more developed, and the maxillary portion of the skull noticeably wider than in *Chimarrogale* (figs. 4, 5).

The reduction in the number of the upper unicuspid has not gone so far in *Nesiotites* as in *Chimarrogale* in which the number is apparently never higher than three.

There is a median internal tubercle in the upper unicuspid of *Chimarrogale* and *Crossogale*, though this may be clearly visible only in unworn, or slightly worn, examples; in worn specimens it becomes merged in an internal cingulum, a condition also seen in *Soriculus*. In these Recent genera, and also in *Neomys*, the main external cusp of the upper unicuspid has become pronouncedly dominant and is generally more forwardly placed than in *Nesiotites*.

Recent *Chimarrogale*, however, shows a more primitive condition than does *Nesiotites* in the upper cheek teeth, in which there is often a third postero-internal cusp in  $pm^4$  and  $M^1$  and sometimes in  $M^2$ . I have not seen a skull of *C. himalayica* with unworn teeth, but this cusp

is present in the teeth of the holotype of *C. styani* (B.M. 99.3.1.8), in examples of *C. platycephala* and *C. varennei*, and also in some specimens of *Crossogale*. In the present collection no trace of this third postero-internal cusp can be seen in the upper cheek teeth of *Nesiotites* including scarcely worn specimens from Menorca (M16049). The staining of the teeth and the development of the internal accessory cusp of the large anterior upper incisor are less in *Chimarrogale* than in *Nesiotites*.

*Classification.* The shrews, *Soricidæ*, have been divided into two groups, one distinguished by the teeth being more or less stained with reddish-brown pigment, the *Soricinæ*, and the other, the *Crocidurinæ*, in which the teeth are entirely white. Mr. Hinton (1911, p. 529) states that this classification was first proposed by Winge in 1877; Dobson, somewhat later, published a similar arrangement (Dobson, P. Z. S. 1890), and this has very generally proved simple and useful. Dr. Stirton (1930) made an interesting attempt to arrange the genera of shrews into groups, and in spite of believing that *Chimarrogale* has white teeth he includes it, not with *Crocidura*, but with *Neomys* and *Soriculus* in his *Blarina* group. This connection, however, does not seem to be very close, and a great deal remains to be learned about fossil forms before a satisfactory understanding of the natural grouping of the shrew genera can be reached.

For the present the Pleistocene Shrews with coloured teeth from the larger Western Mediterranean islands for which the genus *Nesiotites* has been instituted may be grouped with the following Recent genera:—

*Nesiotites* (extinct),  
*Chimarrogale*,  
*Crossogale*,  
*Nectogale*.

These three Recent genera are known only from Asia; according to Allen (1938, p. 143), *Chimarrogale* "... occurs in the hill country from Darjeeling and Sikkim, India, eastwards across Southern China to the mouth of the Yangtze, and southwards into Indo-China, and is found also in Japan." The place of this genus is taken by the closely allied *Crossogale* in the East Indian Archipelago (Thomas, 1921, p. 243). *Nectogale* is known from

Sikkim, Tibet and Western China. The connection between *Nesiotites* and the Asiatic *Chimarrogale* group of shrews gives added interest to the resemblance which has been noted between the primitive Cretan Pleistocene Rat, *Rattus kiridus*, and the Asiatic *R. edwardsii* of the mountains of Fokien, China, and Northern Burma (Bate, 1942).

According to Dobson's classification, *Nesiotites* should be included in the *Soricinae* since pigment is present on the teeth of each of the species known, though it may be very faint, or even absent, in individual specimens. Turning to the Recent members of the above group it is found that in some species the teeth are coloured, while in others the teeth may be white or only slightly stained. Not only Gray (1842, p. 261) in his original description of *Chimarrogale himalayica* referred to its teeth as white, but so also did Anderson (1873, pp. 228, 231, and 1878, p. 142), who at first deemed this species a *Crocidura*. Dobson (1890, p. 50) included *Chimarrogale* and *Nectogale* (*Crossogale* was not then known) in his subfamily *Crocidurinae* on the assumption that their teeth were invariably white. In this he was followed by Trouessart (1898-99), Weber (1928) and others.

As late as 1938 Dr. Glover M. Allen (1938, p. 142) remarked of *Chimarrogale*, "Just as the Old World genus *Neomys* is an aquatic modification of a soricine type, so this genus is an aquatic form of the crocidurine or white-toothed shrews. . . . The teeth are white throughout and relatively light." This was written in spite of de Winton's (1899, p. 374) interesting and careful description of *Chimarrogale styani* from China, in the course of which he says: "Very slight stain on the teeth, perhaps rather less than in *C. himalayica*". This writer does not, however, seem to have realised the wider implications in regard to the systematic position of the genus. I have had six specimens of *C. himalayica* for examination, and these include the dentition of the holotype (B.M. 42.2.18.1), which was removed from the mounted skin and lacks the large premolars and the molars. This, and another example with much worn teeth, shows no trace of pigment; in each of the four other specimens a careful scrutiny discloses that at least some of the teeth, usually including  $pm^4$  and  $M^{1+2}$ , show trace of colouring, often a faint



light brown stain on the internal aspect of the cusps of the molars.

In a specimen from Sikkim (B.M. 90.1.1.4) this stain can be seen unmistakably on both upper and lower cheek teeth and on the incisors. In the teeth of the holotype of *C. styani* there is definite light brown pigment on each of the teeth, including the unicuspid, in another specimen with much worn teeth no colour is evident, while those of a third show a slight stain. Dr. Prater tells me that there is no staining on the teeth of the single specimen of *C. himalayica* in the collection of the Bombay Natural History Society. In specimens of *C. platycephala*, *C. leander* and *C. varrennei* in the British Museum each shows traces of pigment, though in some cases this is very slight. Likewise colour, sometimes rather faint, has been seen on the teeth of *Crossogale sumatrana*, on those of five out of six examples of *Nectogale sikkimensis*, as well as in one specimen of *N. elegans*.

It is thus proved that, in spite of the absence of colouring in the teeth of some individuals, pigment is present in the teeth of *Chimarrogale*, *Crossogale* and *Nectogale*. In consequence of this fact these shrews must be included in the *Soricinae* with coloured teeth, and excluded from the white-toothed *Crocidurinae*.

It may be well to add that it is not only the coloration of the teeth which distinguishes *Chimarrogale* from *Crocidura*, but also a number of other skull and skeletal differences of which a few may be cited. In *Crocidura* the large anterior incisors are not bifid, the hindmost lower premolar has a single cusp, the hinder lobe of  $M_2$  is more reduced than in *Chimarrogale*, and the size ascendancy of the anterior upper unicuspid appears to be constant. Further, the posterior portions of the maxillæ are widespread; the shape of the condyle of the ramus and the position of the mouth of the foramen ovale are much as in *Sorex*, as opposed to the conditions found in *Chimarrogale*, *Nesiotites*, *Neomys* and *Soriculus*.

#### HABITS.

A search for characters and facts which might have a bearing on the habits of *Nesiotites*, has brought some result, and also some enlightenment not only with regard to the fossil but also to several Recent genera. Although

the three Recent genera with which *Nesiotites* is grouped are all Water Shrews, it is not suggested that the fossil genus had adopted similar habits; in fact it seems more probable that the Pleistocene representatives of *Chimarrogale* and its near allies were terrestrial. The scarcely specialized humerus of *C. himalayica* (fig. 8 h) supports the theory that, like *Neomys*, it has only comparatively recently taken to a semi-aquatic mode of life.

The characters of the skull of *Nesiotites*, particularly the narrow and dorsally rounded snout which is of considerable depth, argue that the several species were not specially adapted for an aquatic nor for a fossorial way of life. This is emphasized by the lack of specialization of the humerus (fig. 8 f).

This last feature is of particular significance since it is well known that, even apart from marine mammals, the persistent intensive use of the mammalian fore limb due to aquatic or burrowing habits over a considerable period of time, geologically speaking, is easily recognizable in the shape of the humerus. Classic illustrations of this are found at the present day in *Lutra* and *Talpa*, while a number of fossil examples are known from Oligocene and even earlier times onwards. A parallel may be found among birds which make intensive use of their flying powers, for example the superficial resemblance of the modern swift's humerus to that of a mole is astonishing.

Shrews generally seem not averse to water and Barrett-Hamilton (1911, part viii. p. 81) says of the British species of *Sorex*: "They swim well and can climb when occasion arises, but probably dig little," and on p. 94, when dealing with the habits of *S. araneus*, he refers to a paper by "Mr. Rope, who has remarked on its semi-aquatic habits . . . ." On the other hand, *Neomys*, the European Water Shrew, cannot be considered completely aquatic; Mr. Brazier Howell (1930, p. 27) has wisely said: "Aquatic insectivores are all small and few of them can venture into deep water for fear of large fish. Hence they must retain in large degree their dependence upon the land, for throughout their lives along the rills which they inhabit escape by a scamper through pebbly shallows may be just as necessary as by diving." The desmans and *Nettionogale* might perhaps be cited as among the exceptions to this observation. To quote Barrett-Hamilton again

(1911, part ix. pp. 139, 140) : " Although it obtains most of its food in streams or ponds, the Water Shrew is in no way dependent for existence upon water. In fact, it has been so often found at such distances from situations apparently most congenial, as to suggest that it is at least equally at home in woods and pastures. . . . It has been observed hunting among dead leaves in plantations, . . . It may even breed at a distance from water, . . . " Considering these habits of *Neomys* it was not surprising to find that its humerus (fig. 8 e) is only slightly broadened distally, and is not highly modified. These two characteristics together certainly suggest that its aquatic habits are not only partial, but must have been comparatively recently acquired. Corroboration is supplied by the superficial characters of various species, for while the northern *N. fodiens* has fringed feet and also a keeled tail there are other forms such as *N. milleri* Mottaz of southern central Europe and *N. anomalus* Cabrera of Spain, in which the feet are fringed but the tail is not keeled. Dr. Ognov (1933) has added forms from the Ukraine, White Russia and the Crimea to the number of the less specialized species.

*Chimarrogale himalayica* has fringed feet and a keeled tail as well as other external features adapted for a semi-aquatic existence, but its humerus (fig. 8 h) is not more specialized than that of *Neomys fodiens*, which it is said to resemble in its habits (Anderson, 1878, p. 139; Blanford, 1888-91, p. 246). It has already been suggested above that *Chimarrogale*, like *Neomys*, has comparatively recently acquired semi-aquatic habits. The related *Nectogale*, known by two species from Tibet and Sikkim, with wide flat skull, webbed hind feet and other specialized external characters is " a more thoroughly aquatic form than its near ally *Chimarrogale* " (Blanford, 1888-91, p. 247). Unfortunately I have not seen the humerus of this shrew, nor does it appear to have been figured. Another Shrew which may be briefly mentioned is the white-toothed *Anourosorex assamensis*, which is certainly not closely related to *Nesiotites*, but is of interest here because its humerus (fig. 8 c) is highly modified compared with that of other forms examined. I have not found any first-hand information regarding its habits, but Anderson (1878, p. 150) writes : "The structure of the

ear, limbs and tail has special reference to a burrowing habit of the animal . . . .” In connection with *Neomys* and *Chimarrogale* an interesting parallel is found among the carnivora of an animal leading a semi-aquatic life and showing various external specialized characters while the humerus is not specially modified: this is the Mink, *Mustela lutreola*

Since, as already mentioned, the Sardinian and Corsican Pleistocene shrews have been referred by several authors to *Soriculus* some reference to this genus may be opportune. The Indian *S. nigrescens* was described a little more than a hundred years ago (Gray, 1842, p. 261), but so far practically nothing seems known of its habits from field observation. Jerdon (1874, p. 60) mentions that he “found many dead on the roads at Darjeeling without apparent injury.” Blanford (1888-91, p. 230) says: “Nothing is known of the habits of *S. nigrescens*, it is probably a burrower, living in the forest soil.” Wroughton (1916, p. 481), quoting from Mr. Crump, records this shrew as “very common, particularly at about 5,000 to 9,000 feet. Usually found in forest but comes into houses.” Anatomical evidence seems to suggest that *Soriculus* is a burrower, as the following extracts show. Blyth (1855, p. 36) in his original diagnosis writes “. . . . the hind feet of ordinary form and proportions, unadapted for aquatic habits and the tail tapering and a little compressed at its extremity.” Among other characters Fitzinger (1868, p. 13) mentions that the ears are small, very short, and entirely concealed under the fur, and are capable of being closed by lobes situated at their bases. In describing his *S. gracilicauda* Anderson (1877, p. 282) says: “The upper and lower halves of the ear are almost opposed to each other and the antitragus is thickened and placed against the orifice.” Probably the best record is that given by Anderson (1881, p. 203) in which he remarks: “The shoulder girdle is rather far forwards, as in *Talpa*, and from the neck being short, the head is brought near the shoulder, but not to the marked degree as in the mole. . . . . The character of the humerus indicates a burrowing habit of life, which seems probable from the long and nearly straight claws. . . . It is evident that

its affinities are markedly soricine, but at the same time it shows a few in the direction of *Talpa*". The drawing of the humerus of *S. nigrescens* (fig. 8g), which is probably the first to be published, shows that this bone is considerably specialized, and it is interesting to compare it with that of the white-toothed *Anourosorex assamensis* (fig. 8c), also said to be a burrower. The marked difference in the two bones suggests a great need for field observations on these two genera. The contrast between the humerus of *S. nigrescens* and that of *Nesiotites similis* indicate a difference in mode of life and a lack of close relationship.

#### SUMMARY.

A detailed study of a collection of Pleistocene red-toothed Shrews from the large islands of the Western Mediterranean shows that these represent a peculiar genus, with teeth exhibiting more primitive characters than are seen in Recent forms. The name *Nesiotites* is proposed for this fossil genus which includes *N. hidalgo*, sp.n., from the Balearic Islands, *N. corsicanus*, sp. n., from Corsica, and *N. similis* (Hensel) from Sardinia. These extinct species have been compared with a number of fossil and Recent forms, especially from Europe and Asia. Among these the only group with which *Nesiotites* shows close affinity is the one which includes *Chimarrogale himalayica*, the Himalayan Water Shrew. Each of the three Recent genera comprised in this group has adopted an aquatic, or semi-aquatic, mode of life; it is claimed that *Nesiotites* was not an aquatic form, and anatomical and field observations are recorded which indicate that *Chimarrogale*, and also *Neomys*, have only comparatively recently developed semi-aquatic habits.

Interesting facts affecting the systematic position of *Chimarrogale* and its allies are presented: this group has very generally been described as white toothed, and has consequently been included in the *Crocidurinae*. It is now shown that the teeth of these Shrews are pigmented, though the colouring is pale, and may be lacking in individuals, and they should consequently be included in the *Soricinae*.

Definite geological dating of the deposits in which these shrew remains occur is not possible at present, though it is suggested that they may not be later than Middle Pleistocene. The faunal complex, which includes *Nesiotites*, also contains several other extinct genera, and facts are likewise given showing its zoological separation from the present-day mammalian fauna of the western Mediterranean islands.

This note may be concluded by a renewed expression of thanks to the Trustees of the Percy Sladen Trust Fund, and to Mr. M. A. C. Hinton, F.R.S., for giving me free access to the collection of Recent shrew skulls in the British Museum (Natural History), also to Mr. Terzi for his contribution of several beautiful drawings (figs. 1, 3, 7, & 8 a, b).

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LXIV.—*Notes on Hemiptera.* By G. EVELYN HUTCHINSON  
 (from the Osborn Zoological Laboratory of Yale University).

THE following notes are mainly incidental to the study of the collections of the Yale North India Expedition.

**Lygæidæ.**

An unfortunate error was made in preparing the table showing the position of the abdominal spiracles of the various subfamilies of the Lygæidæ in the "Report of Terrestrial Hemiptera-Heteroptera" of the Yale North India Expedition (Mem. Conn. Acad. Arts Sci. p. 133). The entries for the Geocorinæ and Blissinæ are transposed and should be :—

			2	3	4	5	6	7
<i>Geocoris limbatus</i>	..	..	D	D	D	V	V	V
<i>Blissus leucopterus</i>	..	..	D	D	D	D	D	V

My best thanks are due to Mr. H. G. Barber for pointing out this mistake.

*Diomphalus annulicornis* Jak.

*Diomphalus annulicornis* Jakovlev, 1889, Hor. Soc. Ent. Ross. xxiv, p. 332.

*Dolmacoris deterrana* Hutchinson, 1934, Mem. Conn. Acad. Sci. x, p. 130.

Dr. A. Kiritshenko has most kindly sent me specimens of both *Diomphalus hispidulus* Fieb. and *D. annulicornis* Jac.

*Ann. & Mag. N. Hist.* Ser. 11. Vol. xi. 55

There can be no doubt that the insect from Indian Tibet is identical with the latter. Misled somewhat by Fieber's figure, I supposed that the general facies of the Tibetan species differed considerable from *D. hispidulus*. Actually the two species of *Diomphalus* are very similar in general appearance, though the antennæ are shorter in *D. annulicornis* than in *D. hispidulus*. The most striking difference is found in the structure of the rostrum; this is, however, not as marked as comparison of the Tibetan specimens with Fieber's figure led me to suppose. In *D. annulicornis* the second joint just reaches beyond the base of the head, as indicated in my figure; in *D. hispidulus* the middle of the second rostral joint lies at the level of the base of the head. It is, however, an exaggeration to write, as I did on the basis of Fieber's figure, that *D. hispidulus* has the basal joint "reaching almost to the base of the head." There do not appear to be any significant differences in the form or sculpture of the pronotum, the size of the eyes or the armature of the legs between the two species, and generic separation is clearly out of the question.

### Phymatidæ.

#### *Chelocoris chinai*, sp. n.

Head black-brown, posterior margin testaceous, first antennal joint black-brown, second testaceous, darkened apically, third testaceous, fourth testaceous with dark brown apex; pronotum testaceous, anterior part of disc blackish centrally, and posterior part of lateral margins suffused with black; darker parts of head and pronotum with paler papilliform spines; scutellum dark brown, fading to pale testaceous brown apically; elytra testaceous brown, with some darker markings on corial veins, membrane hyaline grey, nerves blackish brown; dorsum abdominis black, connexivum anteriorly and posteriorly mottled with yellow; below testaceous brown mottled with black.

Head moderately elongate, about one-and-a-half times as long as wide (1.28, 0.87 mm.), finely granulate and covered with setiferous papillæ, antenniferous tubercles produced upwards and outwards as acute papillated spines; vertex with a pair of forwardly-directed setiferous

spines set just within the eyes ; postocular lateral margin of head with a row of four large setiferous spines, the anterior spine the smallest, the posterior the largest, gula with a similar but less regular row, ventral edge of bucculæ emarginate centrally. Rostrum just not reaching the

Fig. 1.



*Chelocoris chinai*, sp. n. Dorsal view of holotype ♀).

roundly truncate posterior margin of the prosternum. Antennæ (♀) with basal joint subcylindrical, covered with setiferous papillæ, none of which are enlarged apically to form an outstanding spine, just over twice as long as wide

(0.40, 0.18 mm.), second joint pyriform, about one-and-a-half times as long as wide (0.22, 0.15 mm.), covered with very small setiferous papillæ, none of which are enlarged, third joint elongate conical, about twice as long as wide (0.25, 0.11 mm.), covered with very small setiferous papillæ, fourth joint ellipsoidal, about twice as long as wide, covered with very small setiferous papillæ (0.45, 0.22 mm.); second and third joints together (0.47 mm.) slightly longer than the fourth and distinctly longer than the first. Pronotum about one-and-three-quarters times as wide as long; anterior part of disc in front of the transverse depression finely granulate, posterior part behind the transverse depression denticulo-rugose, with two carinæ, which, starting from the posterior margin of the pronotum from points lateral to the basal angles of the scutellum, run convergently to the anterior border of the transverse depression and are continued on the anterior part of the disc as bifurcated lines of fine papillæ, the outer line from the apex of each carina bending out to run transversely to the lateral margin of the pronotum, the inner line running sinuously to the anterior margin, disc with two large intercarinal spines and a few minute papillæ between the inner branches of the carina, just behind the anterior margin, and two large spines on each of the carinæ at the anterior and posterior border of the transverse depression, across which the carinæ are thickened and more papilliferous; lateral margins with small setiferous papillæ, anteriorly with large bisetous papilliform spines; anterior part of pronotum, before the transverse depression, subtrapeziform; posteriorly sides suddenly expanded to form wing-like subacute postero-lateral angles, re-entrant angle at end of transverse depression with a large setiferous spine; postero-lateral margins sigmoidally sinuate, postero-central margin very feebly bisinuate; propleuron with a row of three small setiferous papillæ, running from the large papillæ at the anterior angle of the pronotum to a large similarly-formed ventral papilla.

Scutellum reaching to about the first third of the abdomen, about three-fourths the length of the pronotum and five-sixths wide as long (1.02, 1.20 mm.), apex subacutely rounded, sides slightly rounded, disc obscurely

punctato-rugose, base with an ill-marked semicircular elevation.

Elytra but slightly surpassing the apex of the abdomen, membrane with two rudimentary transverse nerves, broken centrally, between the central (5th of Handlirsch, 1897, Ann. Naturhist. Hofmus. Wien, xii. p. 127) and the second apparent (3rd of Handlirsch) vein; central cell wider and longer than the undivided cell adjacent to the basal angle (fig. 1).

Anterior coxa with a row of six large spines and a row of smaller spines situated more externally. Femur hardly thicker at its thickest point than the chelar projection and tibia taken together (0.47, 0.40 mm.), slightly longer (1.16 mm.) than coxa (1.02 mm.), about one-and-one-quarter times as long as the tibia (0.91 mm.) and one-and-three-quarters times as long as the outer margin of the chelar projection (0.65 mm.).

Intermediate legs damaged in unique type.

Posterior femur and tibia subequal in length and about two-and-a-half times as long as the tarsus, which is four times as long as the claws (1.75, 1.82, 0.73, 0.18 mm.).

Lateral margins of abdomen evenly rounded.

Length, ♀ 7.3 mm., maximum breadth 3.6 mm.

KASHMIR: 1 ♀ (*holotype*). Gulmarg, 26 June, 1931 (B. M., coll. Fletcher).

The present species is intermediate in size between *C. handlirschi* Bianchi (Annuaire Mus. St. Petersb. 1899, p. 235), from Sechuan (L. ♀ 9.0 mm.), and *C. horvathi* Dudich (Ann. Mus. Nat. Hung. xix. p. 179, 1922), from Kulu (L. ♀ 5.0 mm.).

In the structure of the membrane it also stands between the two previously-described species of the genus, for in *C. handlirschi* the inner cell, though undivided, is said to be longer than the outer, and no mention is made of cross-veins in the outer part of the membrane, while in *C. horvathi* the inner cell at the basal angle of the membrane, though shorter and narrower than the outer, is divided transversely, and there appear to be more numerous rudimentary cross-veins. In coloration and in the proportions of the basal joint of the antennæ, *C. chinai* seems to be more closely allied to *C. handlirschi*, though the relative lengths of the first and fourth antennal joints

(♀) in the latter species appear to be greater, and single spines to be considerably developed on the apices of the first, and, to a less extent, of the second joints.

I have much pleasure in associating the name of my friend, Mr. W. E. China, with this interesting species, in recognition of long-continued help in the study of the Hemiptera.

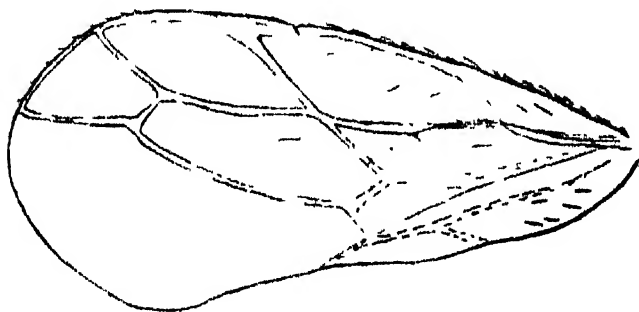
### Cryptostemmatidæ.

*Ceratocombus (Xylonnannus) toda*, sp. n.

♀ holotype ; *forma macroptera*.

Uniformly dark brown, with little trace of markings, general coloration near clove-brown of Ridgeway, but darker ; legs paler and basal two joints of antennæ brownish yellow ; elytra with inner half of membrane somewhat

Fig. 2.



*Ceratocombus (Xylonnannus) toda*, sp. n.  
Elytron of macropterous holotype (♀).

iridescent ; opened elytron, viewed on a white surface, between olive-brown and bone-brown of Ridgeway ; veins of clavus, and the inner vein of corium (*media*) at base, hardly darker, other veins clearly darker than the rest of the elytron, but not conspicuous.

Head with long setæ, the longest a pair just in front of eyes, a pair just within the posterior angle of the eyes and several on the anterior part of the head almost as long. Eyes in lateral view distinctly higher than long, posterior margin in lateral view flattened. Antennæ with basal joint fairly short, second joint just over three times as long

as basal, third and fourth joints each about two-and-a-half times as long as the second (0.07, 0.24, 0.59, 0.59 mm.), longest setæ of third and fourth joints about one-third the length of the joint, incrassated base of third joint bead-like, little wider than the central part. Rostrum reaching just to apex of third coxæ, first joint with fine hairs, second and third joints apparently glabrous. Pronotum trapeziform, about as wide anteriorly (0.37 mm.) and about twice as wide posteriorly (0.74 mm.) as length (0.39 mm.); lateral margins almost straight; anterior constriction well marked by a groove, which is deep laterally but clearly visible, though shallower, centrally; posterior margin broadly emarginate; disc with a shallow longitudinal depression, and a wide irregular and rather obscure transverse depression in front of the posterior border; disc and lateral margins with dark bristle-like pubescence, the lateral margins behind the anterior constriction bearing about thirteen such bristles, the longest of which are 0.03 mm. Scutellum rather under one-and-a-half times as wide basally as long (0.52, 0.37 mm.), sides slightly concave, disc pubescent except at base.

Elytra with the venation typical for the subgenus, rather thick in texture, with long (up to 0.06 mm.) scattered hairs, not exclusively associated with the venation, on the clavus and basal two-thirds of the corium, and with numerous hairs on the costal margin almost to the apex. Costal thickening narrow, except basally, and of even width throughout the greater part of its length, costal fracture very short and narrow, set beyond the middle of the costal margin, near the apex of the first costal cell (fig. 2).

Anterior femur somewhat incrassated, anterior tibia markedly incrassate apically, all tibiæ with fine hairs, anterior and posterior tibiæ also with a few bristles, intermediate tibia with a single very large bristle about one-fourth of the length from the base.

Length 2.96 mm.; greatest width 0.88 mm.

♀ *forma brachyptera*. As *holotype*, but smaller, total length 2.16 mm. Longitudinal pronotal impression apparently stronger than in type. Membrane of elytra about half as broad as in typical macropterous form.

NILGIRI HILLS : 1 ♀ forma *macroptera* (holotype), 1 ♀ f. *brachyptera* (paratype), Pykara, on wet earth, 15 November, 1932 (holotype, Peabody Museum of Yale University, coll. Yale North India Expedition, paratype, U.S. National Museum).

The venational characters of the elytra, shown in fig. 2, indicate this species to be a member of the subgenus *Xylonnannus*. Three species of *Xylonnannus* are at present known from the Old World, namely *corticalis* Reuter (the subgenotype), from Europe, *C. (X.) enderleini* Poppius, from East Africa, and *C. (X.) tairanus* Poppius, from Formosa. *C. (X.) toda* differs from all these species, none of which are over 2 mm. long, by its larger size. The structure of the pronotum of *C. (X.) toda* also appears to differ from that of these three species, in which the groove demarcating the apical constriction is evidently more or less interrupted centrally, while in *C. (X.) toda* it is distinct, though shallow in the region of the mid-line. *C. (X.) enderleini* is described as having short hairs on the elytra veins as well as on the costal margin; the other species lack hairs on the disc of the elytra. In its large size, completely demarcated apical stricture, narrow costal thickening and hairy elytra, the present species would seem to have resemblance to *C. (X.) major* McAtee and Malloch (Proc. U.S. Nat. Mus. lxxvii. Art. 13, p. 6, pl. 1, fig. 1, 1925), from the West Indies. In *C. (X.) major* the elytral hairs, though more numerous, are confined to the veins.

Poppius has described (Arch. Naturges. lxxx. A, no. 8, p. 77, 1914) as the type of a new subgenus *Tagalonannus*, *C. (T.) coloratus*, from the Philippine Islands. This subgenus clearly approaches *Xylonnannus* in its venational characters, the exact significance of which is hard to evaluate without a figure. *C. (T.) coloratus*, however, is clearly a much smaller (1-1.5 mm.) and less hairy species than *C. (X.) toda*.

*Crescentius principatus* Distant (Fauna Brit. India, Rhynchota, ii. p. 409, 1904), from Burma, the only member of the subfamily hitherto recorded from the mainland of southern Asia, was founded on a unique specimen, accidentally destroyed during the process of description. There are undoubtedly errors in Distant's account of this insect, as,



for instance, in his description of the antennæ, and no significant neurational characters can be ascertained from his figure. In coloration and hairiness, and to some extent in the form of the pronotum, this rather large ( $2\frac{1}{2}$  mm.) species appears to resemble *C. (X.) toda*. The figure of *Crescentius principitus*, however, shows what is described as a "distant circular indentation or foveation between the eyes," and the anterior tibiæ are portrayed as of uniform thickness throughout. Just how much emphasis can be placed on these differences is difficult to decide, but until topotypical specimens from Burma are available, it is clearly better to regard Distant's species as different from the one described here from southern India.

### Notonectidæ.

*Notonecta* (N.) *maculata* f. *fulva* de la Fuente.

? *Notonecta glauca* var. *fulva* de la Fuente, 1898, *Actas Esp. Hist. Nat.* xxvi. p. 130.

*N. maculata* var. *fulva* Hutchinson, 1927, *Ann. & Mag. Nat. Hist.* (9) xix. p. 375.

*N. maculata* var. *fulva* Hutchinson, 1928, *Entom. Mon. Mag.* lxiv. p. 35.  
Nec. *N. maculata* var. *fulva* Poisson, 1928, *Bull. Soc. Ent. Fr.* 1928, p. 109.

Nec. *N. maculata* var. *fulva* Esaki, 1928, *Ann. & Mag. Nat. Hist.* (10) ii. pp. 70-75.

Nec. *N. maculata* var. *fulva* Hungerford, 1933, *Kansas Sci. Bull.* xxxiv. p. 50.

In 1927, I referred several almost immaculate specimens of *N. maculata* to *fulva* de la Fuente, on the grounds that the most extreme specimen, a ♀ from Naples, agrees substantially with de la Fuente's description, and that Delcourt had stated that immaculate specimens of *maculata* occur racially in Portugal, and sporadically in Spain, Italy, and North Africa. In the next year Esaki referred a reddish immaculate *Notonecta*, from the island of Guernsey, taken with *N. maculata* var. *fulva*. Hungerford, who has examined this Guernsey material, points out that the immaculate specimen is not conspecific with the others, and should probably be referred to *glauca*; Hungerford therefore regards *fulva* as probably the same as the reddish subspecies of *glauca*, described by Poisson as *N. g. rufescens* from southern France and North Africa, and

known to extend northwards to Brittany. There can be no doubt that Hungerford is correct in regarding the Guernsey specimen as *N. g. rufescens*. Another specimen of *glauca* from Guernsey in my collection (St. Sampson's, 25 March, 1925) is perhaps not quite as rufous as the specimen discussed by Esaki. It is, nevertheless, distinctly redder than any British or Tyrolean specimen in my possession, and is certainly very close to Poisson's figure of *N. g. rufescens* from Banyuls (yr. Or.).

The fact that the few specimens of *N. glauca* from Guernsey that have been critically studied must be regarded as *N. g. rufescens* does not, however, dispose of my former contention that the almost immaculate *maculata* from the Mediterranean region may be referred to *fulva*. Commenting on my note, Poisson writes: "l'auteur ne complète pas la diagnose de Fuente en ce qui concern la pigmentation des tergites abdominaux." In order to guard against any error in this matter I have re-examined my material, and can state definitely that even the most immaculate specimen has the orange marking on the metanotum and sides of the dorsum abdominis, the orange wing-veins, and the ♀ genitalia, characteristic of *M. maculata*; the scutellum is entirely black, so avoiding confusion with *pallidula* Poisson. It is therefore clear that, in parts of southern Europe, two reddish and almost immaculate *Notonectæ* occur, one *N. g. rufescens*, the other a form of *N. maculata*. It seems improbable now that any way exists of deciding which form de la Fuente had before him; the simplest course to take, therefore, is to regard *rufescens* as the valid name of the southern subspecies of *glauca* and to regard my usage of 1927 as fixing the identity of *fulva*, as a form of *N. maculata*, in the absence of any certain evidence to suggest a contrary procedure.

# THE ANNALS AND MAGAZINE OF NATURAL HISTORY

[ELEVENTH SERIES.]

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LXV. *Some Observations on the Staphylinidæ of the Broun Collection of Coleoptera in the British Museum, with descriptions of new Genera and Species* By MALCOLM CAMERON, M.B., R.N., F.R.E.S.

A NUMBER of species described by Broun have no affinity with the genera in which he placed them and depend on a merely superficial resemblance without regard to structure; this is particularly so in the Aleocharinæ but, unfortunately, lack of material for dissection in most cases renders their position still doubtful.

## PHLÆOCHARINI.

*Phlæocharis maori*, sp. n. (Fauvel in litt.).

Reddish brown, the head blackish, the fore-parts dull, the abdomen more shining. Antennæ red, the first three segments and legs reddish yellow. Length 2 mm.

Larger and more robust than *subtilissima* Mannerh., differently coloured and with longer antennæ. Head narrower than the thorax, the eyes large and prominent, strongly coriaceous and with moderately close, small flat umbilicate punctures. Antennæ extending to the posterior angles of the thorax, a little thickened towards the apex, 3rd segment a little shorter than the 2nd, 4th and 5th slightly longer than broad, 6th to 10th very slightly transverse. Thorax transverse (4.75 : 3), convex, the sides gently

rounded, retracted in front, the base on each side near the posterior angles with a small round impression, the puncturation similar to that of the head in character but finer and closer, coriaceous. Elytra as broad as but longer (4.5 : 3) than the thorax, finely and closely punctured. Abdomen narrowed towards apex, finely and less closely punctured than the elytra, the ground-sculpture fine and reticulate on the first four visible segments, coriaceous on the 5th and 6th. Pubescence throughout moderately long and close, yellow.

New Zealand. Tairua. Glen Hope.

#### PROTEININI.

NESONEUS, gen. nov. (Bernh. in litt.).

Differs from *Proteinus* Lat. in the 4-segmented tarsi, parallel build, the head with the posterior angles distinct and everted, the maxillary palpi different. Head narrower than the thorax, the neck stout, the eye much longer than the post-ocular region, which ends behind in a small everted angle. Labrum short and broad, the anterior border gently rounded. Mandibles small, pointed edentate. Maxillary palpi with the 1st segment very small, 2nd stout, twice as long as broad, 3rd stouter, oval, as long as the 2nd (much longer than in *Proteinus*), 4th long, acicular, longer than the 3rd. Inner lobe of maxilla narrow, curved and pointed at apex and with a few spines below, outer lobe membranous, as long as but broader than the inner, closely covered with short hairs. Tongue and labial palpi scarcely differing from *Proteinus*. Prosternum short, its process very narrow and pointed, the epimera long, narrowed towards apex. Mesosternum simple, its process long and narrow, extending nearly the whole length of coxæ and meeting the short metasternal process, the coxæ narrowly separated. Abdomen rather broadly bordered above, the base below carinate. Tarsi 4-segmented, the first two segments short, the 3rd a little longer, the 4th longer than the preceding together.

Type : *Acuticeps* Cam.

*Nesoneus acuticeps*, sp. n. (Bernh. in litt.).

(*Protinus glaucus* Broun in litt.).

Black, moderately shining. Antennæ black, the first two segments and legs reddish yellow. Length 2 mm.

Head narrower than the thorax, the eyes large, the post-ocular region very short, the posterior angles distinct and everted: epistome triangular, produced in front and separated by a curved ridge (the concavity forwards) from the rest of the head, behind it with another similar ridge, the two between them bounding a crescentic impression; disc without foveæ, strongly coriaceous and scarcely punctured. Antennæ rather slender, the first two segments of equal length, third a little shorter, 4th small, transverse, 5th to 10th broader, differing but little, slightly transverse, 11th as long as the 9th and 10th together. Thorax transverse (3.75 : 2), convex, the sides rounded in front, straight and retracted behind, the posterior angles obtuse and everted, more coarsely coriaceous than the head and impunctate. Elytra parallel, twice as long as the thorax and a little broader, the sculpture close, fine and asperate. Abdomen closely, finely and asperately punctured throughout.

New Zealand: Waitak, North Island (*R. N. Parker*).

*Nesomeus sparsior*, sp. n. (Broun in litt.).

Colour and build of *acuticeps* Bernh., but a little smaller and narrower, the antennæ similarly constructed but thinner, head without ridges between the eyes, before the base with a pair of very small, widely separated foveæ, coriaceous, without punctures as in that species: elytra less closely and less finely punctured, not asperate, the abdomen less closely punctured than in *acuticeps*, coriaceous. Length 1.75 mm.

New Zealand: Midhurst.

## OMALIINI.

### OMALIUM Grav.

#### Subgenus *STENOMALIUM* Bernh.

Build of a narrow parallel-sided *Omalium*, but at once distinguished by the structure of the maxillary palpi and the mesosternum only carinate in the anterior half. The maxillary palpus has the 1st segment very short, the 2nd short, thickened towards apex, 3rd slightly longer and stouter than the 2nd, short broad oval, the 4th slender cylindrical, much narrower than the 3rd and a little longer. From *Phyllodrepa* it differs in the facies, structure

of the maxillary palpi and the last segment of the posterior tarsi longer than all the preceding together. From *Brouniellum* Bernh. by the structure of the maxillary palpi, flat pronotal epipleura, absence of boss at the base of the elytra and the incompletely keeled mesosternum. In this genus must be placed *Omalium antipodum* Broun with the following synonymy :—

*Omalium prolixum* Broun.

*Omalium stencsoma* Broun.

*Omalium fusciventre* Broun.

*Phyllodrepa apicalis* Bernh.

*Omalium apicale* Fauv. in litt.

*Omalissus castaneus* Broun = *Xylodromus concinnus* Marsh.

#### PÆDERINI.

##### *Astenus zealandicus*, sp. n.

Head and thorax red, elytra dark brown, the posterior margin and postero-external angles rather broadly reddish yellow, the shoulders obscurely lighter, abdomen black, more shiny than the fore-parts, the posterior margins of the tergites reddish yellow. Antennæ and legs pale reddish yellow. Length 3.75 mm.

Build of *melanurus* Küst., but rather more robust, differs in the colour and much longer and more slender antennæ, the sculpture of the two species scarcely different.

New Zealand : Waihakei. Broun Collection. Type in British Museum.

*Lithocharis longipennis* Broun is a *Lathrobium* Gr.

#### XANTHOLININI.

*Metoponcus fulvipes* Broun is a *Leptacinus* Er.

##### Key to the New Zealand Xantholinini.

- |   |                             |
|---|-----------------------------|
| 1. Elytra with straight suture. Antennæ feebly geniculate. Neck broad,.....                                   | <i>Othius</i> Steph.        |
| Elytra with imbricate suture. Antennæ strongly geniculate. Neck narrower....                                  | 2.                          |
| 2. Depressed species. Median frontal sulci distinct, moderately long and parallel, the lateral obsolete ..... | 3.                          |
| More or less convex species .....   | 5.                          |
| 3. Palpi with the terminal segments narrow and subulate .....   | <i>Pachycorynus</i> Motsch. |
| Palpi with the terminal segments broader, not subulate .....  | 4.                          |

- |  |  |
|--|--|
| 4. 4th segment of maxillary palpi longer than the 3rd: 3rd segment of labial palpi longer than the 2nd. Superior marginal line of thorax not deflexed, evanescent in front ..... | [gen. nov.<br><i>Pseudocorymus</i> ,         |
| 4th segment of maxillary palpi shorter than 3rd: 3rd segment of labial palpi longer than 2nd. Superior marginal line of thorax deflexed from the middle. ....                    | [gen. nov.<br><i>Paracorymus</i> ,           |
| 5. Median frontal sulci distinct and moderately long .....   | 6.   |
| Median frontal sulci obsolete. ....  | 8.   |
| 6. Terminal segments of palpi subulate .....   | <i>Leptacmus</i> Er.                         |
| Terminal segments of palpi not subulate. ....  | 7.   |
| 7. Labrum rounded in front with median emargination. Mandibles sulcate externally .....  | <i>Xantholinus</i> Serv.                     |
| Labrum tri-emarginate in front, the emarginations arcuate. Mandibles not sulcate, only with a small fovea at base. ....  | <i>Inuloscytalinus</i> Heller.<br>[gen. nov. |
| 8. 4th segment of maxillary palpi fully as long as 3rd .....   | <i>Paraxantholinus</i> ,                     |
| 4th segment of maxillary palpi only about a third as long as 3rd. ....   | [gen. nov.<br><i>Neoxantholinus</i> ,        |

NEOXANTHOLINUS, gen. nov.

Facies of *Xantholinus* Serv. Head with obsolete median frontal grooves, the lateral fine, long, oblique, not well marked. Neck narrow (1:4.5): undersurface on each side with a keel from base to apex. Labrum short and broad, feebly rounded in front. Mandibles grooved externally from the base to beyond the middle, the right with two small blunt teeth, the left with a bicuspid or two separate teeth, a larger and smaller. Maxillary palpi with the third segment cylindrical, much longer than the 2nd, 4th short, scarcely a third as long as the preceding and a good deal narrower at the base, conical. Mentum broadly and slightly emarginate in its whole breadth in front, the anterior angles prominent, not carinate in the middle. Labial palpi with the 1st segment short, 2nd nearly twice as long, 3rd subulate, about half as long as the preceding. Tongue small, transverse, rounded in front and with a small triangular notch in the middle of the anterior border. Paraglossæ large, extending beyond the tongue. Thorax with the superior marginal line not deflexed, united with the inferior near the clavicle. Prosternum large, its process very short and triangular, extending but little between the coxæ. Mesosternal process long, laterally

compressed and carinate, separated by a short intersternal piece from the metasternum, the coxæ narrowly separated. Anterior tibiae with two or three spines externally near apex : middle with more numerous spines, the posterior without any. Anterior tarsi short, the first four segments short and subequal, slightly emarginate at apex : middle longer and more slender, the 1st segment scarcely longer than broad, 2nd longer and more slender, the 3rd and 4th decreasing in length and emarginate apically : posterior similar.

Type of genus, *Metoponcus rufulus* Broun. *M. brouni* Shp. is also referable to this genus.

#### PARAXANTHOLINUS, gen. nov.

In build much resembling *Nudobius* Thoms., but differing in the dilated anterior tarsi, different prosternal structure, and the head with a lateral ridge on the under-surface : from *Xantholinus* Serv. it differs in the dilated anterior tarsi, obsolete frontal grooves, the short broad labrum feebly rounded in front, etc. Head below with a narrow keel on each side in nearly the whole length ; gular sutures fused except in front. Labrum short and broad, almost truncate in front and finely, obscurely crenulate. Maxillary palpi with the 4th segment as long as the 3rd, its base a little narrower than the apex of the preceding. Mandibles grooved externally for more than half their length, both with two blunt teeth close together on the inner border. Labial palpi with the 3rd segment longer than 2nd. Tongue small, broader than long, the anterior border with a small arcuate emargination ; paraglossæ large, extending beyond the tongue. Prosternum strongly carinate : superior marginal line of thorax scarcely deflexed, widely separated from the inferior and only joining it adjacent to the clavicle. Middle coxæ widely separated, the intersternal piece short. Anterior tibiae with a few spines on the apical half, the middle and posterior with more numerous ones. Anterior tarsi dilated, the first four segments cordiform : middle with the first three segments equal, of moderate length, 4th shorter, 5th as long as the 3rd and 4th together : posterior very similar.

The type of this genus is *Xantholinus sharpi* Broun.



## PSEUDOCORYNUS, gen. nov.

Near *Pachycorynus* Kr. and of similar facies. Frontal grooves narrow, parallel, moderately long, the lateral oblique and feeble post-ocular sulcus absent. Labrum transverse, feebly emarginate in front in its entire width. Mandibles grooved externally for half their length, the right with a large blunt tooth about the middle of the inner margin, the left with a smaller one. Maxillary palpi with the 4th segment longer than 3rd, rather slender at the base, but stouter than in *Pachycorynus*. Labial palpi rather long, 2nd segment shorter than the 1st, 3rd longer than the 1st and subulate. Tongue small, broader than long, the anterior border rounded. Paraglossæ large, extending beyond the tongue. Mentum strongly carinate along the middle. Prosternum strongly carinate. superior marginal line evanescent towards front, not joining the inferior. Mesosternal process meeting the metasternum without an intersternal piece, the coxæ rather widely separated. Elytra with straight feebly imbricate suture. Anterior and middle tibiæ with spines, the posterior without. Anterior tarsi with the first four segments short, crescentic, the 5th longer than the preceding together. middle with the first four segments short and subtriangular, the 5th as long as the preceding together. posterior with first four segments short, cordiform, the 5th rather longer than the preceding together.

Type of genus, *Xantholinus cultus* Broun. and includes *X. mediocris* Broun.

## PARACORYNUS, gen. nov.

Build of *Pachycorynus* Motsch.; differs from it in the stouter not subulate terminal segments of the palpi, stouter neck and the deflexed superior curved line of the thorax. From *Pseudocorynus* Cam., it is distinguished by the post-ocular sulcus, the shorter 4th segment of the maxillary palpi, the 3rd segment of the labial palpi not subulate, the non-carinate mentum and deflexed superior curved line of the thorax. Neck rather slender (1.75 : 5). Frontal furrows distinct, rather long, parallel, the lateral obsolete; post-ocular sulcus narrow, distinct and extending to base of head. Labrum small transverse, arcuately emarginate in the middle. Mandibles stout, grooved externally, the right with small blunt tooth about the

middle, the left with a larger one. Maxillary palpi with the 1st segment small, 2nd slightly curved and thickened towards apex, 3rd a little longer, 4th shorter than 3rd, conical, a little narrower at the base than the apex of the preceding. Labial palpi with 1st and 2nd segments of equal length, the 3rd longer. Tongue small, membranous, rounded in front. Mentum not carinate. Thorax with the superior marginal line deflexed about the middle, meeting the inferior by the clavicle. Meso- and metasternum separated by a very short intersternal piece, the coxæ rather widely separated. Anterior and middle tibiæ with spines, the posterior without. Anterior tarsi with the first two segments short, a little longer than broad, 3rd and 4th shorter, subtriangular, 5th almost as long as the preceding together: middle with the first four segments decreasing in length and size, the 3rd and 4th deeply emarginate at apex, 5th as long as the three preceding together: posterior with the first four segments short, emarginate at apex, together as long as the 5th.

Type *Xantholinus arecæ* Broun.

The genus *Indoscytalinus* Heller is represented by *chloropterus* Er.

#### STAPHYLININI.

*Staphylinus ovicollis* Broun is a *Philonthus* (*Gabrius*) near *nigritulus* Gr.

*Hadrotus wakefieldi*, sp. n. (Broun in litt.).

Size and colour of *crassus* Mannerh., and except for the slightly longer elytra similar in build, but differing in the following respects: the last six segments of the antennæ are blackish, the ground-sculpture of the head and thorax much more evident, coriaceous, fine, but the puncturation much more sparing and less distinct; elytra a little longer than in *crassus*, the longitudinal striæ fewer but with close transverse striæ not found in that species, practically impunctate and without ground-sculpture; abdomen closely and uniformly punctured throughout, more finely and densely than in *crassus* and without smooth area along the middle, the pubescence denser. Length 15 mm.

New Zealand: Methven xi. 1911. Type in British Museum.

*Quedius (Ediquus) fultoni*, sp. n. (Broun in litt.).

Shining, head darker, thorax lighter reddish brown, elytra red, abdomen black, the posterior margins of the tergites rufescent. Antennæ and legs reddish yellow. Length 5 mm.

In colour much like *microps* Gr., but much narrower and the antennæ longer. Head as long as broad, narrower than the thorax, the eye small, about half as long as the post-ocular region; juxta-ocular punctures two in number and one or two others between it and the neck; ground-sculpture fine and transverse. Antennæ with the 3rd segment a little longer than the 2nd, 4th to 10th all longer than broad, decreasing in length, the 10th only slightly so. Thorax as long as broad, the sides feebly rounded, distinctly retracted in front, the disc before the middle with a pair of punctures and the usual marginal ones; ground-sculpture as on the head, elytra as long as and slightly broader than the thorax, finely rather closely punctured, finely pubescent. abdomen a little narrower towards the apex, as finely but scarcely as closely punctured as the elytra, the pubescence uniform and not dense.

New Zealand: Taieri. Unique. In British Museum. Broun Collection.

*Quedius (Microsaurus) tripunctatus*, sp. n. (Bernh. in litt.).

Black, shining, the posterior margins of the tergites broadly rufescent. Antennæ and legs yellowish red. Length 6 mm.

At once distinguished from all the other black New Zealand species by the long elytra. Head suborbicular, slightly transverse (3.5 : 3), narrower than the thorax, the eye about as long as the post-ocular region, between the eye and the neck closely and moderately finely punctured and with two large umbilicate punctures. Antennæ rather long, the 4th to 10th segments all longer than broad, decreasing in length, the penultimate distinctly longer than broad. Thorax as long as broad, the sides gently rounded, distinctly retracted in front, the disc with four quadrately placed punctures, otherwise, except for the usual marginal punctures, impunctate. Elytra longer (6 : 4.5) and slightly broader than the thorax, a little longer than broad, closely and finely punctured and with long yellow depressed

pubescence. Abdomen narrowed from base to apex, about as finely but distinctly less closely punctured than the elytra, the pubescence long, uniform, not dense, the sides and posterior margins of the tergites with some long black setæ. No locality label is attached to this specimen, which is unique and in the British Museum Collection of Broun.

*Quedius (Microsaurus) quadripunctus*, sp. n. (Bernh. in litt.).

Head black, thorax black or dark reddish brown, shining, with four quadrately placed punctures on the disc; elytra brownish red, abdomen black, the posterior margins of the tergites broadly rufescent or entirely brownish red. Antennæ reddish, the 1st segment and legs reddish yellow, the middle and posterior tibiae a little infusate. Length 6 mm.

Var. *deficiens*, n. Thorax bipunctate.

Except for the much smaller eyes resembles *asturisticus* Bernh. in colour, size and build. Head slightly transverse, suborbicular, narrower than the thorax, the eyes rather large, a little longer than the post ocular region with two juxta-ocular punctures and another nearer the neck, the post-ocular area closely and rather finely punctured and pubescent, otherwise impunctate. Antennæ slender, the 3rd segment as long as the 2nd, 4th a little longer than broad, 5th to 10th as long as broad, differing but little. Thorax slightly transverse (3.5 : 3), the sides very slightly rounded, a little retracted in front, the disc with four quadrately placed punctures, the anterior pair further apart from each other than the posterior pair, otherwise impunctate except for the usual marginal punctures, the ground-sculpture as on the head, fine, transverse and wavy. Elytra as long and as broad as the thorax, broader than long, closely, finely and roughly punctured and with fine yellow pubescence. Abdomen a little narrowed towards the apex, closely, finely and roughly punctured and with long yellow pubescence throughout, which is denser at the sides of the tergites. The type in the British Museum is without locality label. The aberrant form *deficiens* is from Korokoro.

*Quedius (Microsaurus) mannaiaensis*, sp. n. (Broun in litt.).

Black, head and thorax shining and with slight greenish reflex; elytra and abdomen less shining, the posterior

margin of the 5th and more or less of the 6th visible tergites reddish. Antennæ reddish yellow, sometimes infusate from the 4th segment. Legs yellowish red, the middle and posterior tibiæ more or less infusate. Length 10 mm.

In build much resembling *cruentus* Ol., but larger, differently coloured, and with differently constructed antennæ. Head suborbicular, slightly transverse, narrower than the thorax, the eyes rather small, shorter than the post-ocular region, against the eye with two umbilicate punctures and between the eye and the base on each side with four others placed quadrately, otherwise impunctate, the ground-sculpture very fine, transverse and wavy. Antennæ with the 3rd segment slightly longer than the 2nd, 4th to 8th longer than broad, decreasing in length, the 9th and 10th as long as broad, 11th slightly longer than 10th. Thorax transverse (6.3 : 5), the sides feebly rounded, almost straight and strongly retracted in front, on the disc a little before the middle with a pair of rather widely separated umbilicate punctures, otherwise impunctate except for the usual marginal punctures, the ground-sculpture as on the head. Elytra longer (6 : 5) and scarcely broader than the thorax, finely and closely punctured, the pubescence rather long, yellow, depressed and moderately close. Abdomen a little narrowed towards the apex, closely and somewhat roughly punctured, less finely than the elytra, the pubescence yellow, rather close and long.

The type in the British Museum is without locality label. I have specimens from Korokoro and Wellington sent by Mr. G. V. Hudson.

*Quedius (Sauridus) diversicollis*, sp. n.

Shining, head black; thorax dark reddish brown; elytra yellow faintly variegated with light brown; abdomen black, the posterior margins of the tergites rufescent. Antennæ reddish, the first three segments reddish yellow. Legs red. Length 6 mm.

Very similar in coloration to *cavelli* Broun, but at once distinguished by the shape of the thorax, larger head and more robust build. Head large, transversely suborbicular, very slightly narrower than the thorax, the eyes distinctly longer than the post-ocular region, with two adjacent punctures, the post-ocular region with two others, the

ground-sculpture very fine, wavy. Antennæ with the 5th to 10th segments slightly transverse, differing but little. Thorax slightly transverse (4·3 : 4), the sides almost straight ; slightly retracted in front, the disc with a pair of small punctures a little before the middle and the usual marginal punctures ; ground-sculpture as on the head. Elytra longer (4·5 : 4) and a little broader than the thorax, finely and rather closely punctured, as in *cavelli*, and with yellow depressed pubescence. Abdomen narrowed towards the apex, finely, rather less closely punctured than the elytra, the pubescence yellow, uniform, scarcely denser at the sides.

New Zealand : Reefton. Unique. British Museum.

*Quedius (Raphirus) ophthalmicus*, sp. n.

Shining, head and thorax black with greenish reflex, elytra pitchy black, the suture and posterior margin rather broadly indeterminately rufescent, abdomen black, the sides of the tergites closely covered with golden pubescence, the posterior margins of the 5th and 6th visible segments narrowly rufescent. Antennæ blackish, the first three segments and legs reddish yellow. Length 7 mm.

Near *auricomus* Kies., but with differently coloured, stouter antennæ, the head narrower, the thorax shorter and broader ; from *cavelli* Broun (*variegatus* Fauv. in litt.), which it resembles in the antennal structure, it differs in the narrower head, much larger eyes, narrower longer thorax, differently coloured elytra and thicker abdominal pubescence. Head round, narrower than the thorax, eyes very large, the post-ocular region very short and with a long black seta, along the ocular border with four or five small punctures, otherwise practically impunctate, the ground-sculpture fine, transverse and wavy. Antennæ rather short, the 3rd segment slightly shorter than the 2nd, 4th slightly longer than broad, 5th to 10th as long as broad, scarcely differing, 11th a little longer than the 10th. Thorax slightly transverse (4 : 3·5), the sides gently rounded, distinctly retracted in front, the disc a little before the middle with a pair of umbilicate punctures, the sides at the middle with a setiferous puncture, the base with a few others, the sculpture otherwise like that of the head. Elytra a little broader and slightly longer than the thorax (4 : 3·5), rather finely, not very closely punctured and

brown. Legs reddish yellow, the middle and posterior tibiæ a little infusate. Length 7 mm.

In build scarcely differing from *Casioquedus gularis* Shp., but much smaller, the antennæ and legs differently coloured. Head orbicular, slightly narrower than the thorax, the eyes large but not prominent, almost as long as the post-ocular region, puncturation rather fine and close, in the post-ocular region with two or three larger umbilicate punctures, the frontal margin impunctate, the ground-sculpture fine, transverse and wavy, the pubescence short and depressed. Antennæ long and slender, the 2nd segment shorter than the 1st, 3rd longer than the 2nd, 4th longer than the 3rd, 5th to 10th all much longer than broad and differing but little, the 11th fully as long as the 10th. Thorax as long as broad, the sides gently rounded in front, retracted and feebly sinuate behind, the anterior angles depressed and rounded, a little in front of the middle with a pair of umbilicate punctures and near the anterior margin on each side with a setiferous puncture and two others on the side-margin, the base with a row of small punctures, otherwise impunctate and without pubescence; ground-sculpture as on the head. Elytra parallel, broader and nearly twice as long as the thorax (7.5 : 4), finely rather closely punctured and closely covered with short depressed yellow pubescence, the humeral angle with a black setæ; ground-sculpture absent. Abdomen gradually and slightly narrowed to the apex, closely and less finely punctured than the elytra, closely covered with long yellow pubescence, the sides with three or four long black setæ.

♂: 6th ventral segment with a small arcuate emargination in the posterior margin.

New Zealand: Hokitika, 26.1.37 (*G. V. Hudson*). Type in my collection.

#### TACHYPORINI.

##### *Conosoma hudsoni*, sp. n.

Shining, head and thorax lighter or darker reddish brown; elytra and abdomen pitchy black, the posterior margins of the tergites rather broadly reddish yellow. Antennæ and legs reddish yellow. Length 3.3 mm.

A slender species, in build much like *pumilus* Shp., but smaller and differently coloured and different antennæ.

Head very finely and very sparingly punctured and without ground-sculpture. Antennæ with the first five segments of about equal length, the 6th to 8th shorter and decreasing in length, the 9th and 10th slightly transverse, the 11th as long as the two preceding together. Thorax transverse (3.3 : 2.5), the sides gently rounded, retracted in front, extremely finely, only moderately closely punctured and without ground-sculpture. Elytra long, parallel, much longer than the thorax (4.3 : 2.5) and a little broader, finely and rather closely punctured, ground sculpture absent. Abdomen slender, pointed, finely and moderately closely punctured, the ground-sculpture feeble, the sides and apex with long black setæ. Pubescence throughout yellow, not dense.

New Zealand: Arthur's Pass (*Hudson*). Greymouth (*Helms*). Broun Collection. Type in my collection.

[To be continued.]

LXVI. -Notes on some Parasitic Nematodes. By H. A. BAYLIS, M.A., D.Sc., Department of Zoology, British Museum (Natural History).

#### Fam. ASCARIDÆ.

*Contracæcum spiculigerum* (Rud., 1809).

A collection of helminths kindly presented to the Museum by Prof. D. R. Burt, of the University of Ceylon, includes specimens of this species from the darter (*Anhinga melanogaster*), besides various cormorants, in Ceylon. *C. spiculigerum* was recorded by Linstow (1906) from the darter in Ceylon, but the writer (1936) suggested that the record might possibly refer to *Contracæcum tricuspe* or another species.

#### Fam. HETERAKIDÆ.

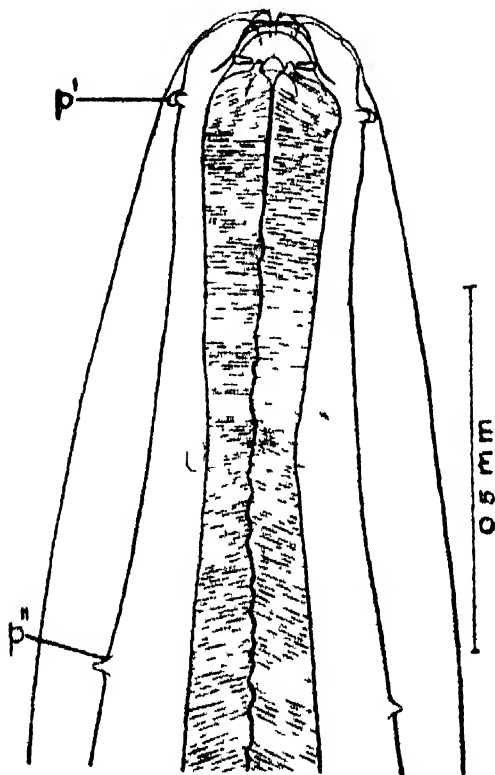
*Ascaridia trilabium* (Linstow, 1904). (Fig. 1.)

Prof. Burt's collection includes specimens of this species from the "jungle crow," *Centropus sinensis parrotti*, in Ceylon. The redescription of the species, based on Linstow's types, given by the writer (1936) requires correction in the particular. It was there stated that



"a pair of stout cervical papillæ is situated immediately behind the base of the lips." Study of the present specimens shows that there are actually *two* papillæ on each side in this position, situated one immediately above the other in the thickness of the lateral ala (fig. 1, *p'*). The presence of these two pairs of papillæ has been confirmed by re-examination of the original material. There is also another pair of papillæ much farther back, some distance

Fig. 1.



*Ascaridia trilabium*. Anterior end of female; dorsal view.  
*p'* and *p''*, anterior and posterior cervical papillæ.

behind the nerve-ring (fig. 1, *p''*). The tail of the female, in Prof. Burt's specimens, reaches a length of 0.9 mm. or more.

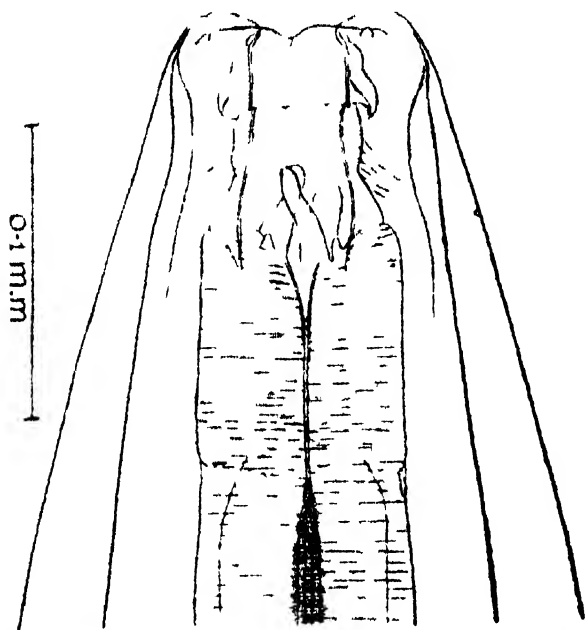
*Subukura perarmata* (Ratzel, 1868). (Fig. 2.)

Ratzel (1868) described "*Heterakis*" *perarmata* from the tarsier (*Tarsius spectrum*), and Meyer (1896) described "*Filaria*" *sarasinorum* from the slender loris

(*Loris lydekkerianus* [*L. gracilis*]), both from Ceylon. Both species have been referred by later authors to the genus *Subulura*.

Prof Burt's collection includes specimens, from *Loris tardigradus grandis* in Ceylon, which the writer has determined as *Subulura perarmata*. This species was redescribed by the writer (1926) on the basis of material from the type host in Borneo. Previously to this Baylis and Daubney (1922) had recorded *S. sarasinorum* from the

Fig. 2.



*Subulura perarmata*. Anterior end of female, dorsal view.

slender loris in the Zoological Gardens, Calcutta, but did not redescribe the species. The brief description of *S. sarasinorum* given by the writer (1936) is based on that of Meyer. On comparing the present material from Ceylon with the specimens previously recorded from Calcutta and from Borneo, the conclusion has been reached that all three sets of material are of the same species, viz. *Subulura perarmata*. This species therefore occurs both in the tarsier and in the slender loris. There is little in Meyer's (1896) description of *S. sarasinorum* to indicate that his species is distinct from *S. perarmata*, and it seems probable that the former is a synonym of the latter. This point

however, cannot be definitely established without re-examination of Meyer's type-specimens.

The writer's (1926) figure of the head of *S. perarmatus* did not show the annular external thickening of the wall of the anterior portion of the buccal capsule. This, though not equally well developed in all individuals, is a characteristic feature, and a new figure is therefore given (fig. 2).

#### Fam. SPIRURIDÆ.

##### *Pseudophysaloptera soricina* Baylis, 1934.

Prof. Burt's collection contains two male and two female specimens which are assigned to this species. The host was the shrew *Suncus cæruleus kandianus* in Ceylon. *P. soricina* was originally recorded from *Crocodyra* sp. in Tanganyika Territory. The present specimens are rather larger than the types, and agree closely with those described by Chen (1937) from *Suncus cæruleus* in South China. Chen figures and describes what he doubtfully regards as a pair of spicules in the male. A paired structure was seen in the present specimens, somewhat resembling that shown in Chen's figure, but it appears to be a supporting structure, shaped like an open V, connected with a muscular cushion surrounding the end of the ejaculatory duct, and not a pair of spicules. The number and arrangement of the caudal papillæ were not made out, but there appears to be no reason to suspect, as suggested by Chen, that the Asiatic form represents a different species from the African.

#### Fam. FILARIIDÆ.

##### *Spirofilaria fulicæ-atræ* (Diesing, 1861). (Fig. 3.)

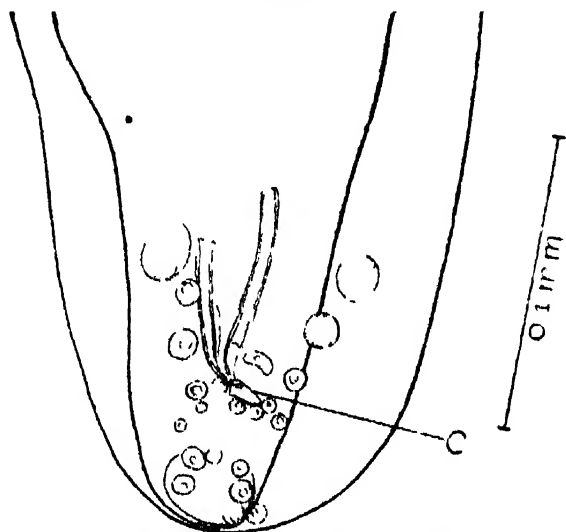
Synonyms: *Nematodum Fulicæ atræ* Diesing, 1861 (nec *Spiroptera Fulicæ atræ* Dies., 1861); *Spiroptera helix* Linstow, 1899 ["=*Nematoideum Fulicæ atræ* Crisp"]; *Spirofilaria podicipitis* Yamaguti, 1935.

Several specimens, found by Mr. J. G. Williams between the leg-muscles, above the tarsus, of a little grebe (*Podiceps r. ruficollis*) at Cardiff, were sent to the writer by Mr. C. Matheson for determination. On examination they appeared to be identical with the form described by Yamaguti (1935) under the name of *Spirofilaria podicipitis*, from the Japanese subspecies of the little grebe.

were also compared with specimens previously obtained by Mr. A. H. Bishop from the knee-joint of *Porzana pusilla obscura*, a rail from Madagascar which had been in captivity in the gardens of the Zoological Society of London. These worms, which had been thought to be a species of *Pelecitus*, proved to be of the same species as those from the grebe.

On examination of the literature, there appears to be no reasonable doubt that Yamaguti's species is identical with that briefly described as *Spiroptera helix* by Linstow (1899)

Fig. 3.



*Spiroflaria fulicæ-atræ*. Posterior end of male; ventral view.  
c., cloacal aperture.

from the knee-joint of a coot (*Fulica atra*) in Germany. Linstow himself regarded this, probably correctly, as identical with the worm mentioned by Crisp (1855) from the knee-joint of the same bird in Britain. Crisp did not name the worm, but Diesing (1861), without having seen it, gave it the name *Nematodum Fulicæ atræ*. Consequently the correct name of the species appears to be *Spiroflaria fulicæ-atræ* (Diesing, 1861)\*.

\* The spelling *fulicæ-atræ* (as adopted by Stiles and Hassall (1920)), instead of the original *Fulicæ atræ*, brings the name of the species into accordance with the International Rules of Zoological Nomenclature (Articles 2 and 15). The use of the name *fulicæ-atræ* for this species does not appear to be invalidated by *Spiroptera Fulicæ atræ* Diesing, 1861 (synonym of *S. fulicæ* Rud., 1819, now known as *Amidostomum fulicæ* (Rud.) Seurat, 1918).

The worms agree fairly closely with Yamaguti's description. Accurate measurement of their length is almost impossible, owing to the corkscrew-like spiral coiling of the body. This coiling is found to be invariably right-handed. Measured in a straight line from head to tail (after preservation in formalin) males are about 7-9 mm. long and females 15-20 mm. The maximum thickness (including the width of the lateral alæ) is 0.35-0.42 mm. in the male and 0.64-0.72 mm. in the female. The cuticle is finely striated transversely, as stated by Yamaguti, but below the superficial layer there appear to be also oblique fibrils crossing each other at right angles.

The mouth is surrounded by six (not four) papillæ. Two of these are lateral and slightly more anterior than the four submedian papillæ. The length of the œsophagus is 0.42-0.58 mm., and its maximum thickness (near the posterior end) 0.055-0.07 mm. According to Yamaguti it is divided into two parts, an anterior "feebly muscular" and a posterior "somewhat glandular" part, but this division is not evident in the present material.

Yamaguti does not figure the caudal end of the male, and was uncertain of the number of papillæ. The writer finds nine pairs of papillæ, and in addition three or four unpaired papillæ. These are arranged as shown in fig. 3. The most anterior pair of papillæ is situated at about 0.1 mm. (not 0.4 mm., as stated by Yamaguti) from the posterior end. Three pairs of lateral papillæ are preanal, and there is also a median papilla in front of the cloacal aperture. On the hinder border of this aperture and at its angles there are four small papillæ, while at about the same level there is a fourth lateral pair. At the tip of the tail there is a cushion-like structure carrying three pairs of papillæ. On the left side, near the tip of the tail, there is a single subdorsal papilla, while on the right side, behind the fourth lateral papilla, one or two small extra papillæ occur. There is altogether a considerable degree of asymmetry in the caudal region, the left caudal ala being much wider than the right. This appears to be a point of difference from *Pelecitus*, in which genus the caudal alæ and papillæ are almost, if not quite, symmetrical. Yamaguti's statement that there are no caudal alæ in *Spirofilaria* is quite erroneous. The spicules, which were

not observed by Yamaguti, are unequal, tubular proximally and membranous distally. The left spicule measures 0.08-0.11 mm., the right 0.06-0.07 mm. The membranous distal portion is much longer in the left spicule than in the right.

The blunt tip of the tail in the female apparently has one pair (not two pairs) of very small, almost terminal papillæ, and a terminal button or "mucron" which is also very small. It is doubtful whether the anus is functional, but there is a slight protuberance marking its position, and a strand of muscle-fibres runs from this point to the dorsal body-wall. The worm is viviparous or ovoviviparous. According to Yamaguti the embryos are "without sheath," but those examined by the writer, after removal from the uterus, appear to be enclosed in delicate membranes.

The genus *Spirofilaria* is considered by Yamaguti to resemble *Saurosis* Macfie, 1924, more closely than any genus occurring in birds. It seems to the writer, however, to be most closely related to *Pelecitus* Railliet and Henry, 1910. A second species of *Spirofilaria* is undoubtedly *Filaria calamiformis* Schneider, 1866, from the parrot, *Amazona aestiva* (synonym, *Pelecitus tercostatus* (Molin) of Travassos, 1930, in part, nec *Spiroptera tercostata* Molin, 1860). Travassos (1930), who has redescribed "*Pelecitus tercostatus*", regards Schneider's species as identical with Molin's, but it seems clear that the forms of which Schneider (1866) and Drasche (1884) have given figures (copied by Travassos) are distinct. The male of *S. tercostata* is shown by Drasche as having symmetrical caudal alæ and papillæ, while in *F. calamiformis* these features are distinctly asymmetrical. Skrjabin (1916) has also redescribed "*Pelecitus tercostatus*," but on comparing his account with that of Travassos it is evident that the two are concerned with distinct forms. Skrjabin's is probably the real *P. tercostatus* (Molin), while Travassos was unquestionably dealing with *F. calamiformis* Schneider. His original figure of the male tail (1930, pl. ii, fig. 16) undoubtedly represents the latter, and shows great resemblances to *Spirofilaria fulicæ-atræ*. Schneider's species should therefore be called *Spirofilaria calamiformis* (Schneider, 1866).

*Pelecitus falconis* (Rud., 1819).

Synonyms : *Spiroptera falconis* Rudolphi, 1819 ; *Spiroptera serpentulus* Diesing, 1851 ; *Pelecitus serpentulus* Railliet and Henry, 1910.

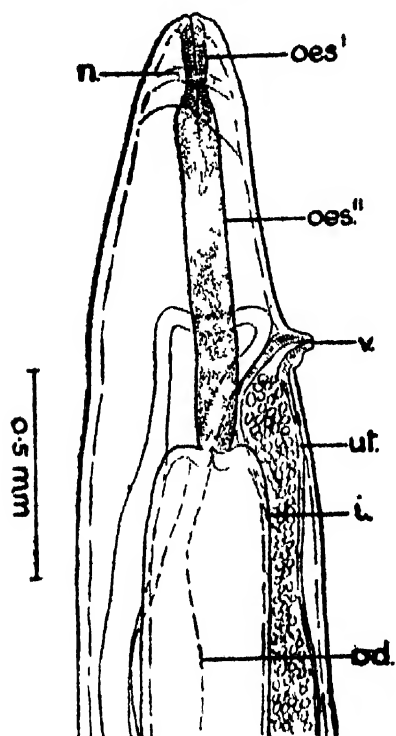
Some specimens, in poor condition, from about the tendons of the toes of a honey-buzzard (*Pernis* sp.) from Mysore State, S. India, are possibly referable to this species. Apparently the correct name of what has been generally called *Pelecitus serpentulus* (Dies.) is *P. falconis* (Rud.), Diesing (1851) having followed his frequent practice and renamed Rudolphi's species. It is true that Rudolphi's (1819) original description is scarcely sufficient for the recognition of the species, but neither Diesing, who figured the worm (1857), nor Molin (1860) added very much to the description. Drasche (1884) gave some redescription of "*Spiroptera serpentulus*," but it seems possible that his material may have included more than one species. He found much variation in the caudal papillæ of the male, and his two figures are so different that they might well represent distinct forms.

The writer's material seems to have occurred in thin-walled cysts. Only 4-6 caudal papillæ on each side can be made out in the males, and of these only 2-3 on each side are preanal. These papillæ are very large anteriorly, decreasing gradually in size posteriorly. Drasche found 4 pairs of preanal and 4-6 pairs of postanal papillæ. He mentions and figures also "eine ovale Zeichnung" in the caudal ala on each side, near the hindmost of the preanal papillæ. This has not been seen in the writer's specimens. Drasche states that the spicules are rarely visible, and that they are very short and apparently equal. In the present specimens the left spicule measures about 0.1 mm. in length and has an obliquely-pointed tip, while the right spicule is about 0.08 mm. long and has a blunt tip. There are broad lateral alæ throughout the body in both sexes.

*Aprocta anthicola* (Linstow, 1903). (Figs. 4, 5.)

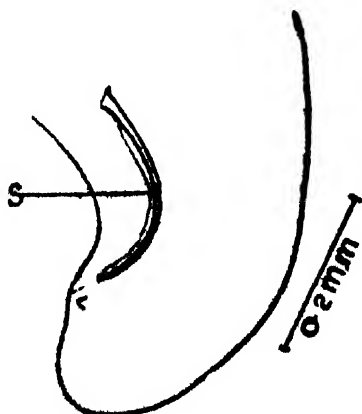
A pair of specimens (male and female) in Prof. Burt's collection are referred to this species. They were obtained from a subspecies of the type host, Richard's pipit (*Anthus richardi rufulus*), in Ceylon. Their situation in

Fig. 4.



*Aprocta anthracola*. Anterior end of female; lateral view. *i.*, intestine; *n.*, nerve-ring; *od.*, enlargement of oviduct, *oes.*' and *oes.\"*, anterior and posterior portions of oesophagus; *ut.*, uterus (right branch); *v.*, vulva.

Fig. 5.



*Aprocta anthracola*. Posterior end of male; lateral view. *s.*, left spicule.



the host is not stated, but was probably the orbital region. The original description of "*Filaria*" *anthicola* by Linstow (1903) is very brief, and was based on females only. So far as the writer is aware, the species has not been redescribed, but it was placed by Skrjabin (1917) in the genus *Aprocta* Linstow, 1883.

The main characters of the present specimens are as follows :—

Length, male, 14.3 mm.; female, 29.5 mm. (Linstow gives 25 mm.). Maximum thickness, male, about 0.45 mm.; female, about 0.6 mm. (Linstow gives 0.47 mm.). The œsophagus consists of a narrow, muscular anterior portion and a wider, densely granular posterior portion. The anterior portion is 0.17 mm. long in the male and 0.22 mm. in the female, while the posterior portion measures 0.6 mm. and 0.8 mm. respectively. The œsophagus is thus about 1/18th of the total length in the male and 1/29th in the female (Linstow gives 1/15th for the latter). The nerve-ring is slightly behind the middle of the anterior portion of the œsophagus.

The caudal end of the male is coiled into a close spiral of, about two turns. The bluntly-rounded tail is 0.14 mm. long, and apparently bears a single pair of subventral papillæ near the cloacal aperture. The spicules are slightly alate or gutter-shaped. They appear to be approximately equal in length and measure about 0.27 mm. along the curve.

In the female the caudal extremity is bluntly conical. There is probably no functional anus. The intestine, which is very voluminous anteriorly, becomes very narrow (about 0.04 mm. in diameter) posteriorly, and ends at about 0.5 mm. from the hinder extremity. From this point a strand of fibres runs back to connect it with the ventral body-wall at about 0.2 mm. from the extremity, and two other strands run across the body-cavity to be inserted in the body-wall subdorsally. The vulva is situated on a prominent papilla at 0.8 mm. from the anterior extremity. It thus divides the length of the body in the proportion of about 1 : 36 (Linstow gives 1 : 35). The vagina is extremely short, and the uterus divides immediately into two branches which run posteriorly from their origin. One branch doubles forward considerably before the other, and the coils of the corresponding ovary lie in the anterior

region of the body, while those of the other are posterior. Each oviduct has a rather wide spindle-shaped enlargement in its course. The thick-shelled eggs, which contain coiled embryos, measure about  $0.044-0.048 \times 0.028-0.03$  mm. (Linstow gives  $0.047 \times 0.029$  mm.).

The differences between this form and the genotype, *Aprocta cylindrica* Linst., 1883, which is also a parasite of Passeriform birds (rock-thrushes), appear to be very slight. The spicules of the male of *A. cylindrica* are stated to be slightly unequal, measuring 0.31 mm. and 0.28 mm., and the eggs are stated to measure only  $0.026 \times 0.01$  mm. The females assigned to *A. cylindrica* and described by Hoeppli, Hsi and Wu (1929) might almost equally well have been assigned to *A. anthicola*, and it seems possible that the two forms may in fact represent a single species.

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### LXVII.—*Some African Bees.*

By T. D. A. COCKERELL, University of Colorado.

[All the bees recorded in this paper are the property of the British Museum.]

#### *Sphecodes woodi*, sp. n.

♀.—Length about 9 mm., anterior wing 6; head and thorax black, but the large labrum light red, and the antennæ entirely red; mandibles long and curved, black at end, and with a well-developed inner tooth; mouth-parts capable of elongation, but the palpi and tongue extremely short; hair of head and thorax scanty, pure white, with a dense fringe around the tubercles; face broad; mesonotum with dense very coarse punctures, the intervals shining; scutellum shining on disc, with few strong punctures; base of metathorax with very coarse rugæ, the intervals shining; tegulæ pale red; wings dusky hyaline; stigma very large, dusky red; nervures brown; basal nervure very strongly bent, falling just short of nervulus; second submarginal cell narrow,

receiving first recurrent nervure a little beyond middle ; third submarginal cell large but little elongated, receiving second recurrent nervure a considerable distance before end ; legs pale red, with thin white hair ; abdomen shining, the first two tergites, and extreme base of third, red ; the apical part of abdomen black, and the apex with short black hair ; second to fourth tergites with a thin patch of white hair on the sides basally.

Nyasaland ; Chiromo (*R. C. Wood* 1995). Recognized by the elongated red labrum, and the red antennæ and legs. In Blüthgen's key it runs near *S. senegalensis* Sichel, but that has dark antennæ.

*Scrapter ugandica*, sp. n.

♀.—Length about 8 mm. ; rather slender, with long tapering abdomen ; black with the legs chestnut red ; head circular seen from in front ; face rather narrow, with dense white hair at sides, mandibles black, antennæ dusky reddish beneath, the scape red in front ; clypeus shining but closely punctured, hair of thorax thin, white, dense at sides of metathorax ; mesonotum closely punctured, but shining between the punctures ; base of metathorax covered with pale tomentum ; tegulæ dark brown, with broadly pallid margins ; wings rather short, perfectly clear hyaline, stigma and nervures brown ; basal nervure falling some distance short of nervulus ; first recurrent nervure far from base of second submarginal cell, but second very near the apex ; hind tibiæ and tarsi with much white hair ; abdomen shining, without bands, the apical tergites brown at base.

Uganda : Madi, May 1927 (*G. D. H. Carpenter*). May be compared with *S. aureifera* Ckll., which has paler legs, pale nervures and much paler antennæ. The type of *S. aureifera* was taken by Miss Mackie at Nieuwoudtville, Cape Province. It is interesting to find this South African genus so far north as Uganda.

*Colletes nanellus*, sp. n.

♂.—Length about 6.3 mm. ; black, with the abdomen dark reddish ; mandibles pale red, dark at end ; flagellum pale red beneath ; middle and hind femora red at apex ; tibiæ red, with a black patch ; tarsi very pale reddish ;

tegulae almost colourless; wings milky white, nervures pale, stigma pale yellowish, without dark margin; malar space long; head and thorax with long white hair, femora with long white hair beneath; abdomen with rather broad but not very dense hair-bands; venter, beyond the base with dense slightly yellowish hair, falling at sides; mesonotum and scutellum very highly polished, not closely punctured; abdomen dull, with the margins of the tergites pale and shining; penultimate sternite with a broad and deep apical notch.

Sudan; Khor Arbaat Delta, April 28, 1926 (*H. B. Johnston*), visiting flowers. Allied to *C. nanus* Friese, but distinguished by the pale tarsi, reddish abdomen, and other characters. In Morice's table (*Trans. Ent. Soc. Lond.* 1904) it runs near *C. nanus* (which I have seen, from the Fayum, in the American Museum of Natural History), but it certainly seems to be distinct. The white pubescence, abdominal bands, pale hind tarsi, and pale stigma and nervures, are suggestive of the South African *C. opacigenalis* Friese, which I have from Henkries, Bushmanland (*Lightfoot*). *C. fuscicornis* Noskiewicz, from Egypt, is also allied to *C. nanus*, but differs in the colour of wings, antennae and legs.

*Allodapula ferreola*, sp. n.

♀.—Length about 5 to 5.7 mm.; thorax, abdomen and legs entirely light red, except that the mesonotum is somewhat dusky, and the scutellum is pale yellow; head dark brown, nearly or quite black above the eyes; clypeus with a large pale yellow mark, constricted in the middle; sides of face with pale linear bands going about half way up front; scape red, pale yellow in front; flagellum dark except at base; tegulae pale testaceous; wings clear hyaline, iridescent; stigma large, pale red; basal nervure falling a little short of nervulus. In the type the second tergite has a broad pale apical band, but this is not clearly apparent in the other specimens.

Cape Province; Mossel Bay, April and June, 1921 (*R. E. Turner*). Three specimens. There is a similar species, with darker abdomen, and the lateral face-marks contiguous with the clypeal band, represented by a specimen in bad condition, labelled "Stigi, germ. E. Africa,

Oct. 1917" (*G. D. H. Carpenter*). It has pale yellow tubercles, connected with a large pale patch on each side of pronotum; the mesonotum is dark red, strongly shining; flagellum black; scape with a broad cream-coloured stripe in front; metathorax with a dark band; front and cheeks shining black. This is evidently quite distinct and apparently is to be referred to *Allodapula rubicundula* (Strand) (as *Allodape rubicundula*), based on two males from Langeburg, Lake Nyassa. Strand's insect is smaller (4.5 mm.), ours being 5.5 mm.

These two species are separated from all others by the small size and red colour.

*Allodape patruelis*, sp. n.

♀.—Length about 7.4 mm., anterior wing 5.5 mm.; robust, head and thorax black, with pale yellow markings, as follows: rather narrow bands along inner orbits, curving away from orbit at upper end; lower margin of clypeus very narrowly; median band on clypeus, so slender as to be a mere line and not reaching upper end; a small triangular supraclypeal mark; minute spots near median ocellus; band along posterior orbits, broadened above middle; four bands on mesonotum, the lateral ones well developed, the median pair slender, but much enlarged, though not approaching, at posterior end; scutellum except at extreme base; spots on axillæ; post-scutellum; area at middle of base of metathorax, upper border of pronotum; tubercles; and a transverse band, enlarged anteriorly, on mesopleura. Tegulæ pale testaceous; wings hyaline, with a yellowish tint; stigma and nervures pale ferruginous; face dull, but front, vertex and mesonotum highly polished; front coxæ very large, pale red, femora black, red at apex; front and middle tibiæ and tarsi pale reddish; hind tibiæ and tarsi black, with much pale reddish hair; first abdominal tergite light red, at hind end with a linear yellow band, which is expanded to a spot on each side; second tergite broadly red in middle, but posteriorly with a black band, and the sides broadly dark; the following tergites are black, with basal pale reddish bands, posteriorly broader and more yellowish; venter black, reddened at sides of basal sternites. Antennæ missing in type.

Ashanti ; Obuasi (*Dr. W. M. Graham*). British Museum, 1908—272.

This is a species related to *A. macula* Strand, but distinguished especially by the pale reddish stigma, and the scutellum yellow right across. It is also closely related to *A. flavocincta* Ckll. It is also near to *A. mea* Strand, differing by the yellow scutellum. According to Hedicke, *A. mea* is a synonym of *A. basalis* Friese. The following key may facilitate identification :

Stigma pale reddish .....	<i>patruelis</i> , sp. n.
Stigma very dark brown .....	1.
1. Abdomen pale red at base, otherwise black, with cream-coloured bands (Moala, Liberia) .....	<i>basalis</i> Friese.
Abdomen pale red or yellowish with dark lateral spots .....	2.
2. Median yellow facial stripe going up to middle ocellus, where it bifurcates .....	<i>macula xanthaspis</i> Ckll.
Median facial stripe not going to middle ocellus .....	3.
3. Larger ; lateral stripes of face strongly curved inward at upper end .....	<i>macula burgeoni</i> Ckll.
Smaller ; lateral stripes not thus strongly curved .....	<i>macula monroviae</i> Ckll.

For further particulars see *Rev. Zool. Bot. Afr.* xxiii. (1933) pp. 269-273.

#### *Halictus abessinicus* Friese.

A female collected by Stordy, labelled "Africa," must be referred to *H. abessinicus*, which is doubtless variable like the related South African *H. perpansus* Ckll. The wings are moderately dusky, the stigma dusky reddish ; tegulae ferruginous, the anterior half covered with hair ; mesonotum dull ; first two tergites clear red, the first with a dusky spot in middle ; tegumentary bands of abdomen four, pale yellowish, the second to fourth broad ; third tergite red at extreme base ; small joints of tarsi red. The recurrent nervures do not approach the ends of the submarginal cells.

#### *Megachile bedfordi* Cockerell.

S.W. Africa : Okahandja, Feb. and March 1928. (*Turner*). Four males ; the abdominal hair-bands vary from pure white to pale fulvous, but in the latter case white at sides. Thus it appears that the variety *kalaharica* Ckll. is no more than an individual variation.

*Megachile admixta clarescens* Cockerell.

Cape Province : Somerset East, 1♂, Nov. 1930 (Turner) ; Aliwal North, 2 ♂, Nov. and Dec. 1922 (Turner).

*Megachile higonella*, sp. n.

♂. —(Type) Length 9 to 10.3 mm. : black, with the build and appearance of *M. grätiosa* Gerst. ; pubescence white, slightly yellowish on clypeus ; legs black, the front tarsi simple, and coxal spines very poorly developed ; antennæ slender, black ; tegulæ very dark brown ; wings hyaline, faintly dusky apically ; stigma and nervures dark brown ; first recurrent nervure distant from first intercubitus not equal to half length of latter ; mesonotum dull, slightly shining anteriorly, the long white hair with black hairs intermixed ; scutellum with much black hair ; no pale band in suture between mesonotum and scutellum ; abdomen with slender white hair-bands, including one on margin of fifth tergite ; upper surface of sixth tergite densely covered with white hair, except just before the incision ; transverse keel with an evident rounded incision, the margins on each side slightly crenulate, not dentate, ; first two sternites largely reddened.

♀. —Length about 9 mm. : front and sides of face with dense pure white hair ; clypeus and supraclypeal area shining in middle ; mandibles black ; hair on mesonotum very short ; sixth tergite with two large round spots of white hair ; ventral scopa white, black on last sternite.

Abyssinia : Higo Samula, Oct. 30, 1911 (*R. J. Stordy*). Two males and a female : also a female labelled "Africa." This is very close to *M. kimilolana* Ckll., from the Katanga, but is smaller, with dark tegulæ and entirely black legs. It differs from *M. opaculina* Ckll. by the fifth tergite of the male without white hair, except the apical band. *M. pulverella* Ckll. from the Sudan, has similar round patches of hair on the sixth tergite of female, but has fulvous tegulæ, and conspicuous bands of white tomentum before and behind scutellum.

*Megachile monileonis*, sp. n.

♀. —Length about 12 mm., anterior wing 7.5 mm. ; black, including mandibles and antennæ, but the femora



are obscurely reddish: checks and underside of thorax with dull white hair, on face and front it is faintly fulvescent, not very dense at sides. on thorax above and behind it is pale fulvous, dense posteriorly, but thin and short on mesonotum; first two tergites of abdomen with pale fulvous hair, the apical band of the second conspicuously pallid; tergites 3 to 5 with inconspicuous bands, sixth bare, with little hair, the two apical sternites with black hair, the others with pale fulvous, not black at sides: legs with pale reddish hair, right mandible tridentate, left with two strong apical teeth, and a long crenulate or denticulate cutting margin: clypeus densely punctured, with a straight thickened shining lower margin: a smooth shining band, with few punctures, on middle of supraclypeal area, and upper half of clypeus: vertex dull: mesonotum and scutellum dull, tegulae black: wings strongly dusky, the apical margin not darker: second submarginal cell receiving first recurrent nervure far from base, second very near apex: posterior basitarsi very large and broad.

Sierra Leone; Iamadu, June 27, 1912 (*J. J. Simpson*). Related to *M. selenstoma* Okll., but easily distinguished by the pubescence of the abdomen. It is also related to the larger *M. konowiana* Friese.

*Megachile rufigaster*, sp. n.

♂.—Length 8-9 mm.; black, with red legs, the front legs clear red, the middle and hind ones dusky; mandibles and antennae black, the flagellum long and slender; under side of abdomen light red, hair of head and thorax white, long and abundant, no dark hairs on dorsum; vertex moderately shining; mesonotum and scutellum entirely dull; no hair-bands in sutures before or behind scutellum; tegulae light brown, with pale margin; wings hyaline, very faintly dusky; second submarginal cell receiving first recurrent nervure far from base, second near apex; front coxae with short spines; front tarsi with a shining channel beneath, but little modified; hind legs with much satiny white hair; abdomen short, the tergites, including the fifth, with marginal white hair-bands; sixth tergite above covered with dense white tomentum, the margin of its transverse keel not dentate, but very

broadly emarginate, the lateral angles pointed, this is best seen from beneath.

" (Germ. E. Africa, Stigi, Oct. 1917 " (*G. F. H. Carpenter*). I do not know where Stigi is; it cannot be Stigi in Swaziland. In my table this runs to *M. ancillula* Vachel, differing by the broader face and red middle legs. It resembles *M. flavipes* Spinola in many respects, but is distinguished by the red under side of abdomen, and the quite different transverse keel of sixth tergite. In Friese's table it runs nearest to *M. fulvitaris* Friese, which differs in the legs and other characters. Two specimens were collected.

*Megachile aireyi*, sp. n.

♀. -Length about 7 mm., anterior wing 6; black, including mandibles and antennae, but legs brown; head without evident pale hair. thorax bare above, but with dense white hair on tubercles, thin hair on pleura, abundant pure white hair at sides of metathorax, mandibles broad, with two strong teeth; mesonotum finely and closely punctured, but shining; scutellum strongly shining in front; tegulae dark brown; wings dark fuliginous; first recurrent nervure rather remote from base of second submarginal cell, but second recurrent almost meeting intercubitus; abdomen cordiform, shining, with obscure reddish bands; a large patch of pure white hair at each side of first tergite, and some white hair at sides of base of second; sixth tergite without light hair; ventral scopa white basally, otherwise red.

N.E. Rhodesia: Mid Luangwa Valley, 23-31 Aug., 1910, 3-1, 800 ft. (*S. A. Neave*). The claws are without pulvilli.

A very peculiar little species, with the size and build of *M. submucida* Alfken, and they agree in having a shining ridge on clypeus, but easily distinguished by the fuliginous wings. The name *aireyi* is based on the collector's middle name.

*Megachile magadiensis* Cockerell.

This was described from the female, collected in Kenya. A male with exactly the same data is supposed to belong here, though the identity should be confirmed by field

observations. It is distinguished from *M. abegnacula* Ckll., *M. apostolica* Ckll., *M. admixta* Ckll., *M. ekuvella* Ckll. and *M. niveicauda* Ckll. by the total absence of a white hair-band on margin of fifth tergite. It is very like *M. ekuvella*, but that has long erect fulvescent hair on first two tergites, our insect has pure white hair on the first and no long outstanding hair on second. There is no red patch at base of anterior coxal spines, such as occurs in *M. thomasseti* Ckll. and *M. clarescens* Ckll. The hair of the face is slightly yellowish, front basitarsi with two widely separated black spots, and boat-shaped appendage present, front femora with the apical half black above, sixth tergite above almost all covered with dense pure white hair; first recurrent nerve far from base of second submarginal cell, second at apex.

*Megachile azarica*, sp. n.

♀.—Length about 8.5 cm., including legs, except that tarsi are obscurely reddish at ends, mandibles red, tridentate, flagellum bright chestnut red beneath; face and cheeks densely covered with pure white hair; middle of clypeus and supraclypeal area shining; thorax with white hair, thin and short on discs of mesonotum and scutellum; a conspicuous sutural band of white hair before and behind scutellum; mesonotum and scutellum dull; tegulae pale testaceous; wings hyaline, the outer margin faintly greyish; stigma and nervures brown; basal nervure meeting nervulus; second submarginal cell receiving recurrent nervures near base and apex; hind basitarsi short and broad; abdomen dullish, heart-shaped, with narrow pure white marginal hair-bands on tergites 1 to 5, on first expanding laterally; sixth tergite appearing black without spots or band of hair; ventral scopa shining white, black at extreme tip.

N. Nigeria: Azara, 1925 (*Dr. Ll. Lloyd*). Closely allied to *M. minutissima* Rad., but larger, with red mandibles and under side of flagellum, and abdomen not conspicuously shining. My *M. minutissime* is from Egypt.

*M. riggentachinna* Strand, from Lake Tsad, has red mandibles, but is larger, and the colour of the pubescence is quite different.

*M. azarica* has the aspect of a desert bee.

*Megachile latimetatarsis*, Strand.

♀.—Length about 10.5 mm. N. Nigeria: Zungeru, March 1911 (*J. W. Scott-Macfie*). This insect, with excessively broad and large hind basitarsi, dark reddish mandibles, and pale golden ventral scopa, black at extreme tip, appears to agree sufficiently with Strand's description.

*Megachile cholmleyi*, sp. n.

♂.—Length about 10.5 mm.; black, including mandibles, legs and antennæ; head and thorax with abundant long hair, slightly tinged with yellowish, distinctly yellowish on clypeus; vertex with long black hair, but no black hair on thorax; mandibles bidentate, the basal portion thinly hairy, the base beneath expanded and greatly broadened; antennæ ordinary; vertex dull; mesonotum and scutellum dull; tegulæ brown; wings hyaline, slightly dusky; nervures dark; first recurrent nervure far from base of second submarginal cell, but second near to apex; front coxæ with strong but not very long spines; legs with long pale hair; front tibiæ hollowed beneath, reddened at apex, their tarsi red; abdomen short and broad, without hair-bands; first two tergites covered with long faintly yellowish hair, from the third on the hair is black, pale reddish at extreme sides, very abundant and black on fifth tergite; at the apical corner of the fifth tergite is a tuft of copper red hair; sixth tergite abruptly descending, the transverse keel with a very large semi-circular incision, bounded on each side by a strong spine, and a couple of spines on margin laterally; apical region of venter with no spines or teeth.

British E. Africa: Njoro (*A. J. Cholmley*). Njoro is 7113 ft. above sea-level. Related to *M. griseola* Ckll. and *M. epixanthula* Ckll., but distinguished by the black hair of vertex and other characters. In the key in *Ann. Mag. Nat. Hist.*, July 1931, it runs to *M. epixanthula*. This has the characteristic appearance of a mountain species.

*Megachile terænsis*, sp. n.

♂.—Length about 10.5 mm.; black, including the bidentate mandibles, antennæ and legs, except that the anterior femora are red in front, although all the tarsi are black; face covered with silky white hair, cheeks with long white hair; clypeus dull and very densely punctate.

tured all over; vertex with black hair; mesonotum and scutellum entirely dull; thorax with long rather dull white hair, thin and slightly mixed with black on mesonotum; tegulae very dark brown; wings dusky hyaline, with dark stigma and nervures; first recurrent nervure far from base of second submarginal cell, but second at extreme apex; legs with white hair, a very long fringe on middle tarsi posteriorly; front coxae with short spines; basitarsi short, second to fourth joints heart-shaped; claws red, with the end black; abdomen short, truncate at end; first tergite with long, slightly yellowish hair; second to fourth with narrow apical hair-bands, not conspicuous; fifth covered with pale hair, and with longer black hair; upper side of sixth densely covered with greyish-white tomentum; transverse keel of sixth tergite with a broad median emargination, but no denticles; no armature at sides or beneath end of abdomen.

Uganda: Tero Forest, S.E. Buddu, 3800 ft., Sept. 26-30, 1911 (*S. A. Neave*).

This runs out in all tables, but is allied to *M. opaculina* Ckll., but has a broader face, and tergites 5 and 6 hairy all over, the hair slightly yellowish.

For ready reference I give a table to separate the above new species of *Megachile*, adding also a few recently described species.

Sixth tergite of male with a strong longitudinal keel, and orange tomentum .....	<i>werrenica</i> .
Sixth tergite without longitudinal keel or orange hair; female without red or orange hair at apex.....	1.
1. Females.....	2.
Males .....	6.
2. With conspicuous white hair-bands before and behind scutellum; ventral scopa white.....	<i>azarica</i> .
Without such hair-bands .....	3.
3. Small species, less than 10 mm. long.....	4.
Much larger species.....	5.
4. Legs red; ventral scopa with apical half red .....	<i>aireyi</i> .
Legs black; ventral scopa white, black at extreme tip (Abyssinia).....	<i>higonella</i> .
5. Ventral scopa red, last sternite with black hair ....	<i>pandonis</i> .
Last two sternites with black hair .....	<i>monileonis</i> .
6. Upper side of sixth tergite without white hair; fifth with much black hair .....	<i>cholmleyi</i> .
Upper side of sixth tergite with white hair .....	7.
7. Legs red .....	<i>rufigaster</i> .
Legs black .....	8.
8. Margin of fifth tergite with a conspicuous pure white hair-band .....	<i>higonella</i> .
Margin of fifth tergite without such a band.....	9.
Very small less than 7 mm. long (Kalahari Desert) ..	<i>natalensis</i> .
Much larger .....	<i>toronensis</i> .

LXVIII..--*On the Freshwater Isopod Genus Cæcidotea*  
Packard. By WALTER E. COLLINGE, D.Sc., President  
of the Northern Ecological Association.

THE genus *Cæcidotea* was described by Packard in 1871. His description of the type, *C. stygia*, is very poor, if not misleading. Subsequent writers, however, have corrected this, and there is no longer any doubt as to the species.

By many, S. A. Forbes<sup>2</sup>, Hay<sup>3</sup>, Chappius<sup>4</sup>, Miller<sup>5</sup> and others, the genus has been regarded as synonymous with *Asellus* Geoffroy.

Its validity has also been questioned by Tattersall<sup>6</sup>, Ueno<sup>7</sup>, Creaser<sup>8</sup>, and Racovitza<sup>9</sup>.

In 1940 Mackin and Hubricht<sup>10</sup> published a valuable memoir which distinctly clarified our views on this genus. They emphasized the value of the characters, "mostly related to the male genital appendages and secondary sex characters of the gnathopods," and showed that "in some cases uropodal characters are usable." This well-illustrated and lucid paper has greatly added to our knowledge of the genus, but it overlooks many other important morphological characters.

I have frequently drawn attention to the fact<sup>11</sup> that characters which hold good in one family of Isopoda are of very little value in another, and for the right understanding of the position and relationship of such some distinct and cardinal characters must be decided upon after careful and extensive study of large series of specimens<sup>11</sup>. Such characters are not apparent in the Asellidæ, so far as my work has shown, and the suggestion here made of a tripartite division is merely a temporary one.

Prof. Mackin has very kindly sent me specimens of *Cæcidotea stygia* Packard (♂ and ♀), *C. acuticarpa* Mack.

<sup>1</sup> Amer. Nat. 1871, v. pp. 744-761.

<sup>2</sup> Bull. Ill. State Lab. Nat. Hist. 1876, pp. 1-32, 1 pl.

<sup>3</sup> Proc. U.S. Nat. Mus. 1903, pp. 417-428, 4 figs.

<sup>4</sup> 'Die Binnengewässer,' 1927, lii p. 175.

<sup>5</sup> Univ. Calif. Publ., Zool. 1933, pp. 97-110.

<sup>6</sup> Journ. Linn. Soc. Lond. 1921.

<sup>7</sup> Mem. Coll. Sci. Kyoto Imp. Univ. 1927, iii, ser. B, pp. 355-368, 6 figs.

<sup>8</sup> Occas. Papers Mus. Zool. Univ. Mich. 1931, pp. 1-7, pp. 1, 2.

<sup>9</sup> Arch. Zool. exp. gen. 1925, pp. 533-622 10 figs.

<sup>10</sup> Trans. Amer. Micro. Soc. 1940, lix, pp. 383-397, pls. i.-iii.

<sup>11</sup> North West. Nat. 1942, xvii, p. 9; 1944, xix, p. 45.

and Hubr. and *C. oculata* Mack. and Hubr., and it is upon these and other material in my collection that the following remarks are based.

At the outset let me say that the whole question of the classification and affinities of the Asellidæ is in a state of flux. New material and new facts are constantly arriving, and it would be very unwise to lay down any dogmatic views on such a puzzling question. What I especially wish to emphasize is that the criteria hitherto used for the separation of both genera and species are unsound and of little value.

In my examination of the specimens so kindly sent me by Prof. Mackin I find a number of variations from his lucid and careful descriptions of *C. aculicarpa* and *C. oculata*, which once more illustrates my contention of the invalidity of the characters in general use and, in consequence, the urgent need for more stable criteria.

In a work in preparation ("A Synoptical Revision of the Genus *Asellus*") I have endeavoured to show that the following characters are good criteria for the separation of both genera and species. Length, breadth and form of the cephalon and metasomatic shield, and the form of the pleura of the segments of the mesosome, all these characters hold good for both sexes; moreover, they do not necessitate minute microscopical examination of every specimen, which is of great importance when dealing with large numbers of specimens.

So far as my studies have proceeded, I have, with a few exceptions<sup>12</sup>, been able to place all the species known to me under one of the groups cited below. In many instances the decision has been most difficult owing to intermediate forms. *Proasellus* Dudich, 1925, and *Conasellus* Stammer, 1932, I regard as synonyms of *Asellus*. *Stenasellus* Dollfus I am not acquainted with.

Seeing that the complete or partial loss of eyes is characteristic of a subterranean habit, we cannot regard these structures as criteria for generic distinction. Moreover, every possible gradation occurs, from the perfect eye to a few indistinct pigment spots. Eyed and eyeless examples are known to occur in a single species.

<sup>12</sup> Owing to lack of sufficient material.

ASELLINÆ.

Cephalon broader than long. Pleura entire. Metasomatic shield broader than long . . . . . *Asellus* Geoffroy.

CÆCIDOTINÆ.

Cephalon longer than broad. Pleura excavate. Metasomatic shield longer than broad . . . . . *Cæcidotea* Packard.

MANCALLINÆ.

Cephalon arcuate, broad. Pleura truncate or sub-truncate. Metasomatic shield linguiform. . . . . *Mancasellus* Harger.

The following interesting varieties have been met with during the prosecution of this work :

*Asellus aquaticus* (Linn.).

Var. *gordoni*, nov. Cephalon and mesosome densely marked with fine wavy sepia lines. Metasomatic shield uniformly light sepia colour. ♂ and ♀.

Var. *mackini*, nov. Whole of body a bright light golden yellow colour. ♂ and ♀.

Var. *hazeltoni* nov. Cephalon with dark marginal lyre-shaped sepia band extending from eye to eye ♀.

Named respectively after Dr. Isabella Gordon of the British Museum (Nat. Hist.), Dr. J. G. Mackin of the State College, Ada, Okla, U.S.A., and Miss Mary Hazelton of Berkhamstead, to all of whom I am indebted for material.

LXIX.—*New Species of African Chrysomelidæ* (Halticinae, Col.). By G. E. BRYANT, F.R.E.S., Imperial Institute of Entomology.

ALL the types of the following new species are in the British Museum (Natural History).

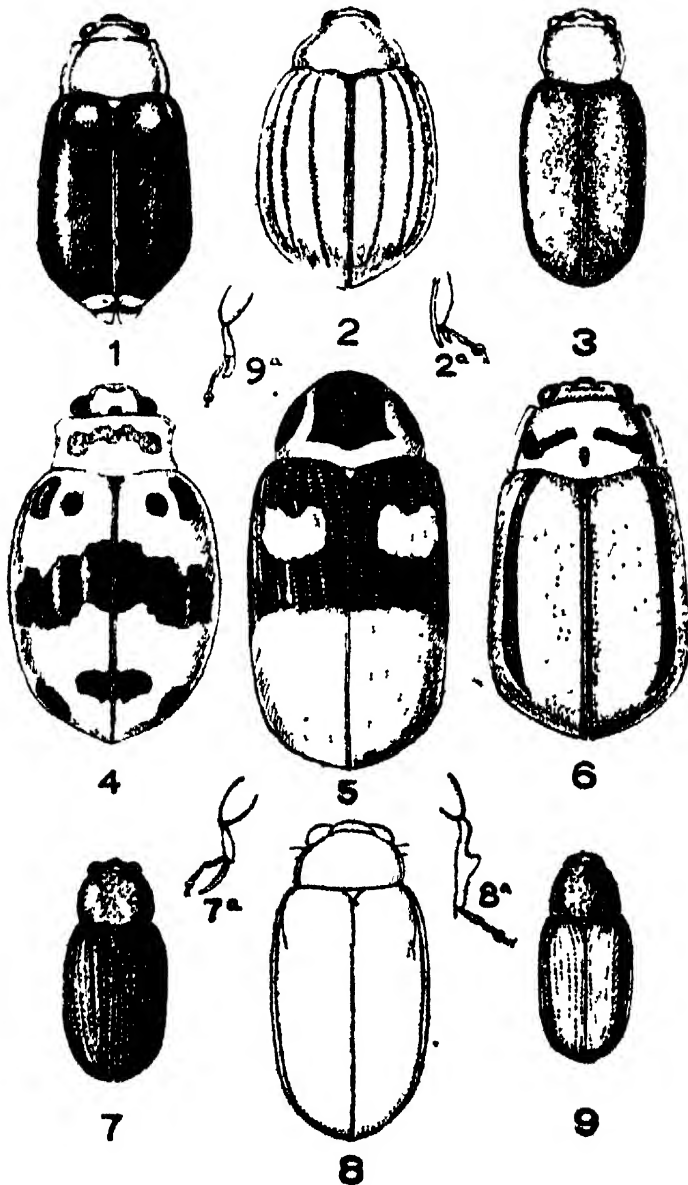
*Philopona bicolor*, sp. n. (Fig. 1.)

Below fuscous, the head, prothorax, antennæ and legs fulvous, the elytra shining black, very finely punctured, the head and prothorax impunctate.

Length 5–6 mm.



Figs. 1 9



1. *Philopona bicolor*, sp. n.  
 2, 2a. *Argopistes capensis*, sp. n.  
 3. *Jamesonia ocruleipennis*,  
 sp. n.  
 4. *Toroderma africana*, sp. n.  
 5. *Cercyonia bimaculata*, sp. n.

6. *Eutornus vittatus*, sp. n.  
 7, 7a. *Serraphula puncticollis*,  
 sp. n.  
 8, 8a. *Jamesonia colae*, sp. n.  
 9, 9a. *Serraphula calcaratum*,  
 sp. n.

♂♀. Head fulvous, nitid, impunctate, impressed near the inner margin of the eyes. Antennæ fulvous, extending to the middle of the elytra, the first segment dilated at the apex, almost equal to the second and third together, the second short and oval, the third long and slender, longer than the fourth. Prothorax fulvous, nitid, impunctate, transverse, the sides broadly margined, slightly rounded, the anterior angles well marked. Scutellum fulvous, nitid, the apex rounded. Elytra black, the apex tinged with fulvous, nitid, and finely punctured, widest behind the middle, the apex somewhat strongly deflexed and then produced. Legs fulvous, with the posterior femora tinged with fuscous, and strongly dilated. Under-side fulvous, with the ventral segments of the abdomen, the second to the fourth equal, clothed with scattered golden pubescence.

UGANDA: Western Ankole, 4,500-5,000 ft., 10-14.v. 1911 (*Dr. S. A. Neave*), 3 specimens; between Seziwa R. and Kampala, 3,500-3,750 ft., 27-31.vii. 1911 (*Dr. S. A. Neave*), 2 specimens; Mt. Elgon, 5,100-5,800 ft., 8-13.vi. 1911 (*Dr. S. A. Neave*), 1 specimen; shores of Lake Isolt, 3,800 ft., 7-8.i. 1912 (*Dr. S. A. Neave*), 1 specimen; Entebbe, 5-9.iv. 1914 (*C. C. Gowdey*), 1 specimen; Kempala, 1.xi. 1915 (*C. C. Gowdey*), 1 specimen.

Allied to *P. tibialis* Wse., but differs in the colour of the elytra and legs.

*Argopistes capensis*, sp. n. (Figs. 2 and 2 a.)

Rounded, convex, flavous, with a golden tinge, the elytra each with three longitudinal darker vittæ, and the suture narrowly darker, the prothorax very finely and not deeply punctured, the elytra very closely and finely punctured.

Length 4 mm.

♂♀. Head flavous, almost hidden in the prothorax, impunctate, the eyes close together. Antennæ flavous, extending almost to the middle of the elytra, the first segment very long, almost as long as the three following together. Prothorax flavous, strongly transverse widest at the base, the sides obliquely converging and slightly rounded from the base to the apex, and deflexed, the posterior margin slightly sinuate. Scutellum small, flavous, triangular. Elytra flavous, with a golden tinge,

each with three darker longitudinal vittæ, and the suture narrowly darker, finely and closely punctured, the side-margins with an irregular line of darker punctures. Legs entirely flavous, the posterior femora strongly incrassate, the posterior tibiæ broadly dilated, deeply sulcate, dentate, and terminated by two spurs, the first segment of the posterior tarsi very long. Underside flavous, the ♂ with the apical ventral segment of the abdomen very large, strongly incised.

S. AFRICA : Cape Province, Somerset East, x. 1930 (*R. E. Turner*), 11 specimens.

Somewhat allied to *A. sexvittata*, Bry., but smaller, not so convex, paler, and the vittæ not so conspicuous.

*Jamesonia cæruleipennis*, sp. n. (Fig. 3.)

Elongate, the head, prothorax, three basal segments of the antennæ and legs flavous, the elytra deep blue, prothorax strongly but not closely punctured, the elytra closely and irregularly punctured.

Length 3.5 mm.

♂. Head flavous, the front impunctate, the basal portion with a few scattered punctures, a strong transverse impression between the insertion of the antennæ, the eyes large and prominent. Antennæ extending beyond the middle of the elytra, the three basal segments flavous, the remainder fuscous, the first slightly longer than the second and third together, the second short and rounded, the third shorter than the second, and transverse, the fourth long, about equal to the first three together, the fifth to the terminal segment each a little shorter than the fourth. Prothorax flavous, strongly but not closely punctured, transverse, the sides slightly rounded and narrowly margined, the anterior angles slightly produced. Scutellum blue-black, triangular, nitid, impunctate. Elytra deep blue, the sides more or less parallel, rounded at the shoulders and apex, closely and irregularly punctured. Legs flavous, the posterior tibiæ armed at their apex with a short spur. Underside with the prosternum flavous, the ventral segments of the abdomen fuscous, with the median portion tinged with fulvous, the apical segment strongly notched.

S. AFRICA : Mossel Bay, Cape Province, ii. 1922 (*R. E. Turner*), 6 specimens.

Somewhat allied to *J. nigripennis* Jac., but differs in size and colour, the head and legs not being black.

*Torodera africanus*, sp. n. (Fig. 4.)

Head and prothorax fulvous, with fuscous markings, elytra ivory white, with eight black maculæ and a median transverse black irregular band, legs flavous, the hind femora black

Length 4 mm.

Head fulvous, with a small median fuscous spot at the base, the mandibles with their apex black, nitid, almost impunctate, impressed between the eyes. Antennæ long and slender, extending to the middle of the elytra, the four basal segments flavous, the fifth to the tenth black, the apical segment paler, the first segment as long as the second and third together. Prothorax fulvous, with a median transverse wavy fuscous pattern not extending to the side-margins, very transverse, the sides feebly margined, the anterior angles oblique, nitid, and very finely punctured. Scutellum black, nitid, triangular. Elytra broader at the base than the base of the prothorax, the sides slightly rounded and tapering to the apex, ivory white, closely and evenly punctured, two black spots at the base on each elytron, a median transverse wavy band not extending to the side-margins, two black spots near the apex on each elytron, the suture narrowly fuscous. Legs fulvous, the apical half of the tibiæ fuscous and the posterior femora black. Underside black, with the apical ventral segment of the abdomen fulvous.

UGANDA : Near Mpumu, 4,000 ft., 14-15. viii, 1911 (*Dr. S. A. Neave*), 1 specimen (*Holotype*); E. Mbale District : S. of Mt. Elgon, 3,700-3,900 ft., 3-5. viii, 1911 (*Dr. S. A. Neave*), 1 specimen

TANGANYIKA TERRITORY : Kilosa, ix, 1929 (*Sir G. A. K. Marshall*), 2 specimens.

Closely allied to *T. 8-maculata* Wse., but differs in the four apical spots at the apex of the elytra and the markings on the prothorax. The two specimens from Tanganyika differ in having three median spots instead of forming a transverse band as in the holotype.

*Cercyonia bimaculata*, sp. n. (Fig. 5.)

Elliptical, convex, flavous, prothorax with three fous patches, finely punctured, elytra with the basal

half black, enclosing two flavous maculae, the apical half flavous, narrowly margined with rufous, punctate-striate.

Length 5 mm.

Head strongly deflexed, rugosely punctured, the vertex and labrum flavous, surrounded with rufous. Antennae flavous, not quite extending to the middle of the elytra, the first segment about twice as long as the second. Prothorax flavous, finely and evenly punctured, very transverse, widest at the base, the sides contracted in front, a large rufous median patch not extending to the base, but touching the anterior margin, a rounded rufous patch near the side-margins. Scutellum flavous, triangular. Elytra very little broader than the base of the prothorax, the sides more or less parallel and rounded at the apex, the basal half black, enclosing two flavous maculae, placed slightly before the middle, the apical half flavous, the side-margins and suture narrowly edged with rufous, strongly punctate-striate. Legs flavous, the hind femora strongly dilated. Underside flavous, the first and apical ventral segments of the abdomen the longest, the third and fourth short and about equal, all the segments with scattered punctures.

B. E. AFRICA: Lagari, I.ii.1900 (*C. N. Betton*), 1 specimen.

Allied to *C. nigrocincta*, Bry., from Uganda, but differs chiefly in the maculae being flavous, not black, and in the pattern of prothorax.

*Eutornus vittatus*, sp. n. (Fig. 6.)

Flavous, the head with a median fuscous spot at the base, the prothorax with three black markings, the elytra with the suture narrowly black, and a longitudinal broad black line on each. Legs more or less fuscous.

Length 7 mm.

♂♀. Head flavous, a median fuscous spot near the base, rugosely punctured, the labrum black and nitid. Antennae short, extending slightly beyond the base of the prothorax, the four basal segments flavous, tinged with fuscous, the seven apical segments black, the first segment long and more dilated, equal to the second and third together, the second short and rounded, the fifth to the eleventh short and broad. Prothorax transverse, flavous, very rugosely punctured, a median black nitid patch near the base, and an irregular more or less V-shaped black patch

on each side, not touching the side-margin, the sides contracted in front, the basal margin slightly sinuate. Scutellum black, nitid, the apex rounded. Elytra flavous, with the suture narrowly black, and a broad longitudinal line extending from the base, but not reaching the apex, rugosely and closely punctured. Legs more or less black or fuscous, the posterior tarsi with the apical segment with a large bladder-like swelling. Underside flavous, except the mesosternum black, the ventral segments of the abdomen with a few large scattered punctures.

N.W. RHODESIA : Shigariatombwes, i. vii. 1913 (*H. C. Dollman*), 9 specimens (*Holotype*); Mwengwa, i. vii. 1913 (*H. C. Dollman*), 4 specimens; Nama-ula, 29. viii. 1914 (*H. C. Dollman*), 3 specimens.

NYASALAND. Cholo, 2,700 ft., xii. 1919 (*R. C. Wood*), 12 specimens.

The specimens from Nyasaland differ in having the marking on the prothorax reduced to three spots.

Allied to *E. dilatatus* Dalm., but differs in the much coarser puncturation. (*Eutornus rugicollis* Jac., 1900 = *E. dilatatus*, Dalm., 1823.)

*Serraphula puncticollis*, sp. n. (Fig. 7.)

Below fulvous, above the head and prothorax fulvous, antennæ with the five basal segments flavous, prothorax finely punctured, elytra fuscous, punctate-striate. legs fulvous, with the femora tinged with fuscous.

Length 1.5–2 mm.

Head fulvous, impunctate, slightly rugose, the frontal elevations strongly raised. Antennæ long and slender, extending beyond the middle of the elytra, the five basal segments flavous, the remainder fulvous, the first segment the longest, the second and third short, together about equal to the first. Prothorax fulvous, slightly transverse, the sides slightly rounded, finely and evenly punctured. Scutellum fulvous, triangular. Elytra elongate, slightly broader than the base of the prothorax, rounded at the apex, fuscous, punctate-striate. Legs fulvous, with the femora tinged with fuscous, the posterior femora strongly dilated, the posterior tibiæ armed at the apex with an elongate appendage, as long as the tibiæ, and furnished along its upper margin with a row of teeth, the tarsi

with the first and second segments very long. Underside fulvous.

S. AFRICA : Fort St. John, Pondoland, ix. 1933 (*R. R. Turner*), 11 specimens.

Allied to *S. elongata* Jac., but differs in colour, in its broader form and the tibial appendage longer.

*Jamesonia colae*, sp. n. (Fig. 8.)

Entirely flavous, with the exception of the antennæ, which have the segments four to nine tinged with fuscous, prothorax and the elytra finely punctured, the posterior tibiæ with a strong tooth on the outer margin.

Length 2.5 mm.

Head flavous, nitid, impunctate, transversely impressed between the eyes, the antennæ extending well beyond the middle of the elytra, the three basal and two apical segments flavous, the six intermediate segments fuscous, the first segment about equal to the second and third together, the fourth about twice as long as the third, and the fourth to the eleventh all about equal. Prothorax flavous, transverse, the sides narrowly margined and slightly rounded, very finely punctured. Scutellum flavous, triangular, impunctate and nitid. Elytra flavous, slightly wider than the base of the prothorax, rounded at the shoulders and the apex, finely and irregularly punctured. Legs flavous, the posterior pair with the tibiæ with a strong tooth on the outer margin at the middle, the tibiæ strongly incurved at the base, a short spur at the apex of the tibiæ. Underside flavous.

SIERRA LEONE : Njala, 30. xi. 1944 (*E. Hargreaves*), 1 specimen ; on Kola flowers.

Somewhat allied to *J. sheppardi* Jac., from Beira, but differs in the longer antennæ and colour of legs and antennæ, and the extraordinary development of the posterior tibiæ.

*Serraphula calcaratum*, sp. n. (Fig. 9).

Ovate, dark æneous, except the head which is fulvous, the prothorax strongly punctured, the elytra punctate-striate, antennæ flavous, with the three apical segments fuscous, legs flavous, the posterior femora æneous.

Length 2 mm.

Head fulvous, the vertex strongly punctured, the basal portion impunctate, the eyes flat and rounded. Antennæ not quite extending to the middle of the elytra, flavous, with the three apical segments fuscous, the first segment longer than the second and third together. Prothorax æneous, strongly and closely punctured, the sides slightly contracted in front, widest just behind the middle. Scutellum æneous, triangular. Elytra æneous, not much wider than the base of the prothorax, punctate-striate, the interstices smooth and flat. Legs flavous, the posterior femora æneous and strongly incrassate, the posterior tibiæ armed at the apex with a broad stout appendage, about as long as the first segment of the tarsus, with the upper margin serrate. Underside fuscous.

S. AFRICA: Cape Town, Milnerton, 14-28. xii. 1925 (*R. E. Turner*), 2 specimens.

Allied to *S. ænea* Jac., but more oval and the posterior tibial spur shorter and broader.

LXX.—*Some Notes on the Copepod Genus Saphirella* Scott.  
By ROBERT GURNEY.

NICHOLLS (1944) has recently re-described the remarkable Copepod larva known so long under the generic name *Saphirella*, and has given reasons for his belief that this is the larva of the genus *Hemicyclops* (Clausidiidæ).

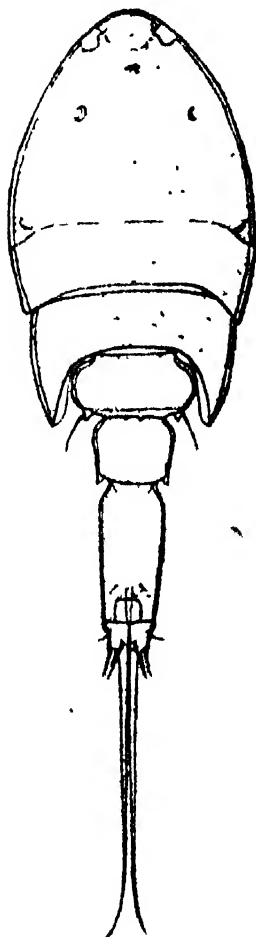
One problem raised by this interesting form is not, in my opinion, solved by this identification, and indeed it is not even stated by Nicholls.

The facts to be explained may be thus stated:—Canu, in 1888, described a Copepodid larva in stage 1 which he had taken in plankton, the mouth-parts of which were the same as those of adult Copepods of the family Clausidiidæ, and he went so far as to refer it provisionally to the genus *Giardella*. Sewell (1924) has also described a similar form under the name of *Saphirella indica*. I have seen these larvæ in plankton at Plymouth, where they are occasionally very abundant, and also specimens from Lake Timsah in Egypt. I have nothing useful to add to Canu's excellent description, but lay stress on the fact that the larvæ are invariably in stage 1 and do not exceed



0.6 mm. in length\*. I found these larvæ impossible to keep alive for long at Plymouth as they had a strong tendency to seek the light and to creep out of the water, so that none moulted into a second stage.

Fig. 1.



*Saphirella* sp. Length 1.25 mm. Dorsal view.

Now the species of *Saphirella* described by Scott (1894 and 1912), Wolfenden (1905) and Nicholls (1944) are all very large—1.06–1.2 mm. I have two specimens of this

\* Canu gives no indication of the size of his specimens. His figure of the whole animal is obviously less magnified than is stated. His figures are better than any that have since been published.

large form from Samoa. The most striking feature of this Samoan form is its extraordinary robustness. In juvenile specimens of Copepods there is usually an air of immaturity in the softness of the cuticle and the appearance of the tissues, but in this case we have individuals in which the chitin of the body and limbs is astonishingly thick, and, apart from the presence of only two pairs of swimming-legs (with unsegmented branches), and the unsegmented abdomen, one would not hesitate to regard them as adults. Scott seems to have been in doubt as to whether his species was adult, and Wolfenden described a genital opening on the third thoracic somite. This is obviously an error, but it is clear that he supposed his specimen to be adult.

Both these forms, then, are in the same stage of development, but, while the first would quite easily fit into the ontogeny of *Hemicyclops* for instance, the second certainly would not.

In normal free-swimming Copepods such as *Diaptomus*, *Eurytemora* or *Cyclops* the adult is about four times as long as the first Copepodid. Even the small form of *Saphirella* is rather large by this standard, but not impossibly so; but the large form is already nearly as large as the adult of any species of *Hemicyclops*, the largest of which do not usually exceed 1.5 mm.\* If it actually goes through the normal series of stages its adult form would have to be more than 4 mm. long, which excludes any known form of Clausidiidæ, or indeed any known free-swimming Cyclopoid.

The large form, for which the name *Saphirella* should be restricted, must either belong to an adult genus not yet discovered, or it must be a persistent larval form comparable to the giant larvæ of Decapoda. The second explanation is difficult to accept because the larvæ is still in the first stage, and we have no reason to suppose that a Copepod can moult and grow without change of form. It is not, as the giant Decapod larvæ are, confined to the high seas, since my own specimens were taken inside the reef at Samoa.

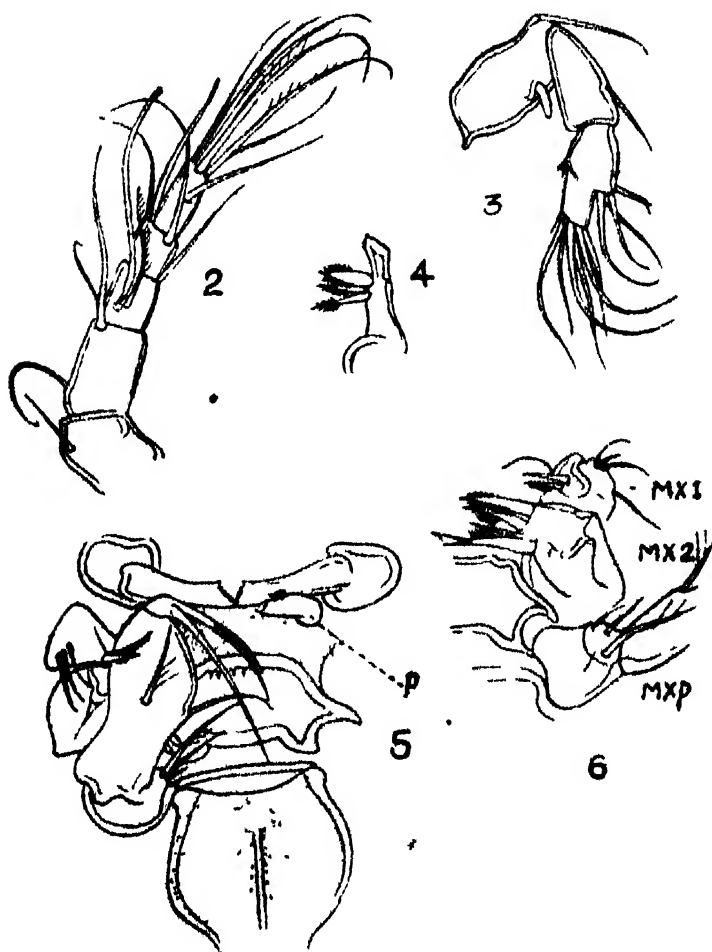
It would seem that *Saphirella* is confined to tropical waters, where our knowledge of semiparasitic Copepods is very incomplete. It is not impossible that there may exist an adult of the postulated size, but it seems most

\* *H. pugettensis* Light & Hartman is 2.66 mm..

unlikely that it will be found to belong to the same genus as the small form.

The Samoan form is not the same species as Wolfenden's *S. tropica*, but I see no advantage in giving it a specific

Figs. 2-6.



2. Antennule.
3. Antenna.
4. Mandible.
5. Mouth parts *in situ*. P=1-segment.
6. Maxillule, maxilla and base of maxillipede.

name. There are, however, a few points in its structure which may be worth noting. In one specimen cleared in caustic soda there is a quite clear line of division between

the head-region and the somite of leg 1, as in some Lichomolgidae, but not in any Clausidiidae.

In the head-region there are some markings in the cuticle which I cannot explain. These consist of a median lenticular thickening corresponding to the position of a median eye (no eye is visible in these preserved specimens), and a pair of semilunar thickenings which give the illusion of a pair of lateral eye-lenses. The somite of leg 2 has large backward prolongations fringed on the inner side by a hyaline membrane.

The somite corresponding to legs 4 and 5 has a pair of ventral markings possibly corresponding to the "genital opening" seen by Wolfenden, but there is no opening, and the marking probably merely foretells the division of the somite at the next moult.

In the antennule there is a long aesthete on each of segments 3 and 4, exactly as shown by Canu. These two aesthetes are also present in Sewell's *S. indica*, but are not shown by Nicholls.

In the specimen examined there was a small process on the first segment of the antenna which may be a vestige of the exopod of the nauplius. The mouth-parts do not differ in any important particular from Nicholls' figures, except that the maxillipede seems to have an additional basal segment.

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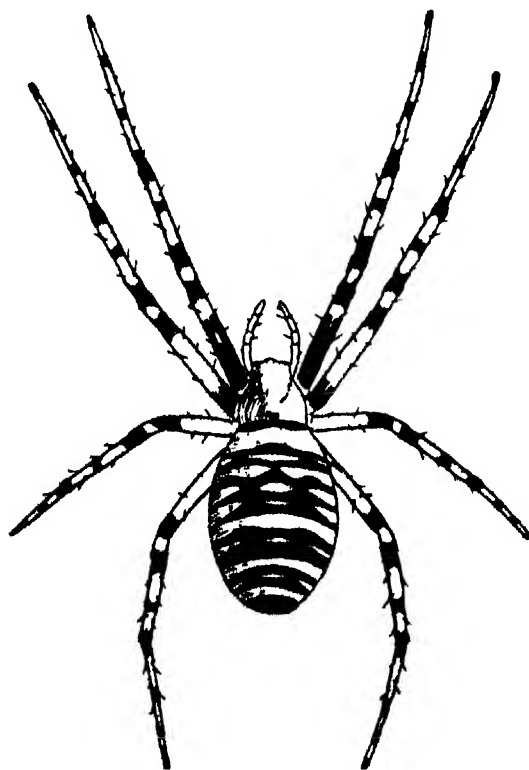
**LXXI.—A Foreign Spider, *Argyope Bruennichi* Scop.,  
established in England. By W. S. BRISTOWE, M.A.,  
Sc.D.**

ONE adult female of the European Argyropid Spider, *Argyope bruennichi* Scop., was sent to the British Museum for identification in 1922. It had been collected near Rye, Sussex.

Nothing more was heard or seen of this species in England until Mrs. Marshall Bell discovered a colony on

wasteland near her home at Southbourne, Hants, in 1940. Specimens collected there in 1944 have been sent me, and during each of the past five summers it has been known to thrive in this locality. Mrs. Marshall Bell has found a second colony at Iford, not far distant, and Mr. Beeching Hall another at Parkstone, Dorset, which he first noticed in 1942.

Fig 1.



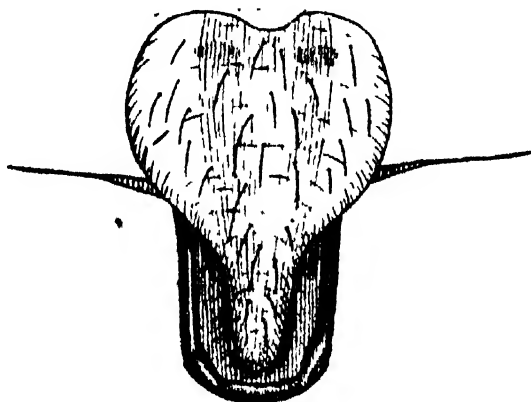
*Argopoe bruennichi* Scop. Female. Length of body, 15 mm.

Abroad I have collected this species in France, Majorca, Greece and Madeira. It is distributed along the coastal areas of northern and western France, but is commonest in the south. It also lives in Germany and a number of other European countries, and it extends into parts of Asia as far as Japan. It is not found in America. There its closest relation is *Argopoe aurantia* Luc. (= *A. cophinaria* W.). These two species were transferred to a separate genus, *Miranda*, by C. L. Koch, on account of

the distinctive design of the female sexual organs. In other species of the genus *Argyope* there is a dividing septum and no conspicuous scape such as is present in *A. bruennichi* Scop. and *A. aurantia* Luc. Authorities in America and Europe do not at the present time recognise the genus *Miranda*.

The species discovered at Southbourne has been recorded by Mr. E. A. Robins (1941, 1942) as *Miranda aurantia* Luc. I have not examined a sufficient number of specimens of this American species to be able to say if there is any constant difference between the female epigyne of

g. 2.



Female epigyne.

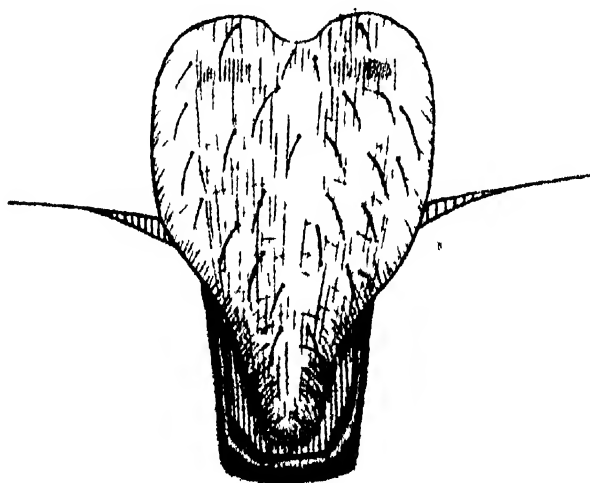
*Argyope aurantia* Luc. and *Argyope bruennichi* Scop., but other characteristics establish our species without any doubt as being *Argyope bruennichi* Scop. The two can be distinguished readily by their size and abdominal markings. The female of *A. bruennichi* Scop. is smaller, usually about 15 mm., and has a series of black lines or bands on a silvery and yellow background. Centrally, and again on the flanks of the abdomen, these lines or bands tend to join. In *A. aurantia* Luc. a large portion of the dorsal surface is black with lines or bands extending laterally.

The cephalothorax of *A. bruennichi* Scop. is silvery in colour. The legs are ringed yellow and black. The palps

are yellow. The sternum is black with a wide longitudinal yellow band. The ventral surface of the abdomen is black or very dark brown with two longitudinal yellow bars. The epigynes show some variation, so I provide drawings made from two specimens. The female from which text-fig. 2 was drawn had not laid eggs. That from which text-fig. 3 was drawn had done so.

No male has yet been collected in England. In this genus the males are insignificant dwarfs. Their body-length is about a third that of the female and, in contrast to the

Fig 3.



Female epigyne.

females, the abdomens are brown in colour. One and sometimes several males sit in each female's web a few weeks before the egg-laying season. In England eggs are laid in August. These are enclosed in a large pear-shaped egg-sac covered with papery brown silk. This is about 20 mm. in length, and it is placed amongst the grass a few inches away from the web. The top of the "pear" is open, that is to say, it is not closed with the papery silk. One of Mr. Beeching Hall's egg-sacs was parasitized by an ichneumon.

The orb webs, spun amongst grass, are not unlike those of the Garden Spider (*Aranea diadema* Linn.) in general

design. They are, however, embellished with two striking silvery zig-zag bands above and below the hub which is itself usually spun over with silk. This "writing" or "signature" is present in all spiders of the genus *Argyope*. Naturalists have disagreed as to the function of the zig-zag bands, but I am satisfied that they help to draw attention away from the spider itself. This may not be conclusive on the evidence provided by an *Argyope* alone, but when one has seen the elaborations of the same technique adopted by other Argyopids in the tropics, one can scarcely avoid reaching the conclusion that they are protective in function.

Several species of spider which now form part of our established fauna have probably arrived from abroad in recent centuries, but this is the first occasion on which we can feel confident about the approximate date of the first arrival of any of them.

*Heteropoda venatoria* Linn. has arrived in considerable numbers with bananas from the West Indies, etc., but has never established itself here. The cooler climate of England has not prevented a few species from the tropics, including *Theridion tepidariorum* (C. L. K. and *Ischnothyreus velox* Jacks., establishing themselves in hothouses. *Physocylus simoni* Berl. has undoubtedly been brought to this country on several occasions with crates of wine from France, and I have found it to be firmly established in wine-cellars in Cornwall, Dorset, Sussex, Berks, London, Middlesex, Herts, Bucks, Oxford, Cambridge, Suffolk and Cheshire, while Lieut.-Commander A. A. D. La Touche tells me he has recently found it in a Portsmouth cellar. Similarly, the distribution in towns of *Segestria florentina* Ross., a southern European species, suggests that it has been conveyed to England in merchandise. I have now found thriving colonies in Exeter, Tiverton, Bristol, Bridport, Exmouth and London, whilst single specimens were recorded from Grange-over-Sands in 1924 and from Plymouth more than a hundred years ago.

*Argyope bruennichi* Scop. has temporarily and perhaps permanently become a member of the English fauna. It will be interesting to see if it continues to extend its distribution as the years go by. The young disperse themselves by air and it was probably by this means that it arrived from the Continent. Considerations of climate



make it improbable that *Argyope* will ever extend its range outside the southern counties.

I have to thank Mrs. Marshall Bell, Mr. L. Beeching Hall, Mr. E. A. Robins, Lieut.-Commander A. A. D. La Touche, Mr. H. G. Rose and Mr. Bushby for information about the English colonies of *Argyope bruennichi* Scop. and specimens. My thanks are also due to Mr. E. Browning of the British Museum for permission to examine *A. aurantia* Luc. and other species in the collection.

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LXXII. *The Premaxillæ in the Asiatic Rhinoceroses.* By  
R. I. POOCK, F.R.S. (Zoological Dept., British Museum  
of Natural History).

IN the Asiatic Rhinoceroses the general structure of the premaxillæ, which carry the pair of upper tusks and occasionally one or two additional but functionless incisors, or their sockets, on each side, is well known. Gray, for instance, pointed out that in *Rhinoceros unicornis* these bones are much stouter than they are in *Rhinoceros sondaicus*. But an examination of the skulls of the three species in the British Museum has recently revealed some

specific and individual variations in the premaxillæ which seem to be sufficiently interesting to be put on record, partly because they are in several cases difficult to explain from the available material

Out of nine skulls of *Rhinoceros sondaicus*, the lesser one-horned species, five have the premaxillæ missing, detached at the point where they joined the maxillæ. This indicates such loose attachment between the bones that the premaxillæ were lost when the skulls were originally cleaned or subsequently. Two only of these five skulls are youngish. The younger, a ♀ from Lower Tenasserim (Hubback, 21.5.15.1) retains  $pm^1$  of the milk set and shows no sign of  $m_3$ . The older (723 *b*), one of the skulls Gray assigned to *nasalis*, has the teeth very little worn and  $m_3$  still imbedded but visible. The remaining three are adult or oldish. A ♂ from Java (C. W. A. Buma, 2.12.18.1) has  $m_3$  in use and a little worn. An oldish ♂ from the Malay Peninsula (Cantor, 79.11.21.178) and another (723 *a*) without locality have  $m_3$  a good deal worn.

Of the four skulls that retain the premaxillæ, two are very much alike. One was from the Sanderbans (Gerrard, 76.3.30.1), the other from Java (723 *d*). They are adult, but not old, males with  $m_3$  more or less worn. In both the premaxillæ are freely movable on the maxillæ. They differ in a small detail. In the right premaxilla of the Javan skull there is the empty socket of a shed incisor just behind the tusk. On the left side there is no trace of a similar socket; and on the skull from the Sanderbans there is no trace of a similar socket on either side (fig. 1, A). Gray's figures of the now destroyed type-skull of *Rh. floweri* (= *sondaicus*) from Sumatra suggest that it resembled the preceding two in having the premaxillæ separated and attached to the maxillæ by a still open suture. It had  $m_3$  fully erupted and was clearly adult, if not oldish (Proc. Zool. Soc. 1867, p. 1015, figs. 3, 4).

The remaining two skulls, with the premaxillæ in place, differ from the preceding in having those bones firmly welded to the maxillæ. They are obviously much older skulls, indeed very old. In one (722 *h*) received from the Zoological Society, without locality, all the cheek-teeth are greatly worn, and the tusks had been shed so long before death that their sockets are nearly filled with corrugated

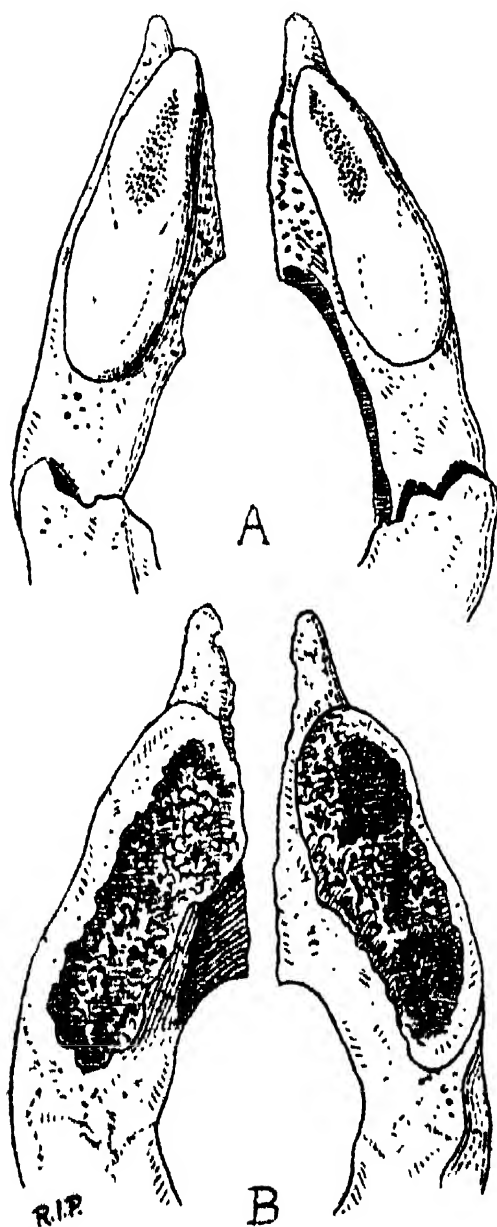
bone. The maxillo-premaxillary suture is almost obliterated, the premaxillæ are separated from each other in front by a narrow space, and each carries a longish bony prominence projecting anteriorly beyond the socket of the tusk (fig. 1, B). The second skull, that of an exceedingly old female from the Kroh forest, Perak (A. S. Vernay, 32.10.21.1), has all its cheek-teeth so loose from the absorption of the roots with age that most of them have fallen out of the jaw. The tusks also are missing, but the alveoli are not filled with corrugated bone as in 722 h. There is no trace of the maxillo-premaxillary suture, and the premaxillæ are ankylosed in the middle line in front, except for a small space between the anterior halves of the sockets of the tusks, and this ankylosis has extended to the anterior processes, which are exceptionally long, and form a projection, wide at the base, narrowed towards the apex, which reaches distally to the level of the tip of the nasals. In the fusion of the premaxillæ and in the great development and coalescence of the processes this skull of *sondaicus* is unique, so far at all events as the British Museum collection is concerned \* (fig. 2, B).

In a series of twelve skulls of *Rhinoceros unicornis* †, the greater one-horned species, the premaxillæ are missing in only three, indicating a much smaller percentage than in *Rh. sondaicus*. The three in which they are missing, attesting loose attachment to the maxillæ, vary considerably in age. The youngest, Gray's type of *stenocephalus* (722 c), of which the locality is unknown, retains the premolars of the milk dentition. The next, from the Nepal Tarai (The Prince of Wales), is a good deal older, but has *pm*<sup>4</sup> of the milk dentition still in use and *m*<sup>3</sup> imbedded but visible in its alveolus. The third, from between the Monas and the Brahmaputra Rivers (Vanderbhyl, 1.3.10.1),

\* There were, I understand, some local expressions of disapproval at the shooting of this rhinoceros owing to the probability of her being one of the last representatives of the species inhabiting the Malay Peninsula. But from her advanced age, so clearly indicated by the skull and teeth, there can be no doubt that she was long past breeding, and would have died a lingering death of old age in the forest in perhaps about a year's time. Even if she had escaped being "poached" by the natives, she would consequently have been irretrievably lost to science. It was fortunate, therefore, that she was secured for the British Museum, where her mounted skin is on exhibition in the public gallery.

† For the settlement of the identity of this species see Ann. & Mag. Nat. Hist. (11) xi, p. 616, 1944.

Fig. 1.



- A. Lower side of premaxillæ of adult ♂ *Rh. sondaicus* from the Sanderbana, (70.3.30.1), with the tusks worn in front  
 B. The same of an unlocalized, much older specimen (722 h), with the tusks shed.

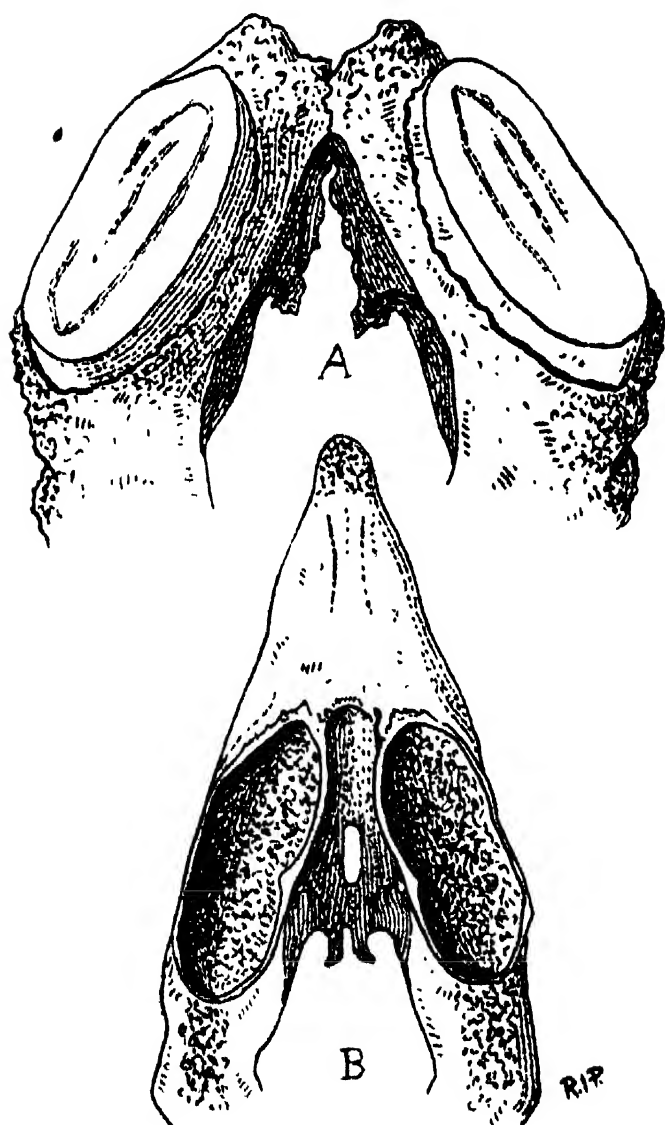
is oldish, having the permanent set of cheek-teeth in use and worn.

In the skulls with premaxillæ attached, the youngest, labelled "India" (70.3.10.18), resembles the type of *stenocephalus* in retaining its milk premolars and differs in this respect from Vanderbhyl's much older skull. The premaxillæ, moreover, are firmly fastened to the maxillæ. An older but barely adult skull from Dacca (G. P. Sanderson, 84.1.22.3), with  $m^2$  only a little worn and  $m^3$  imbedded, differs from the last, although considerably older, in having the premaxillæ movably attached to the maxillæ. A slightly older ♂ skull from Kuch Behar (The Maharajah, 3.2.13.1), with  $pm^4$  of the permanent set in use and  $m^3$  visible in its alveolus, the premaxillæ are movable as in the skull from Dacca. In the rest of the skulls, all considerably older than the preceding, the premaxillæ are immovably, and practically invisibly, fused with the maxillæ, and, with one exception, are almost or quite in contact, without fusion in the middle line in front. Three have definite localities: one from Assam (Zool Soc., 84.1.22.1), another from Gauripore, Assam (Col. Sir C. Russell, 72.12.30.1), and a third, an old ♀ from Nepal (Dr. Oldfield, 1926.6.7.8). In the last two all the cheek-teeth of the permanent set are in use and worn. Two, both old, have no localities, one being unregistered, the other purchased from a dealer (722 f and 51.11.10.2). In the exception above referred to, the unlocalized skull of an old ♂ (722 d), with all the teeth worn, the premaxillæ are firmly ankylosed together in the middle line in front (fig. 2, A).

In *Didermocerus sumatrensis*, the two-horned Asiatic Rhinoceros, the premaxillæ are relatively stouter than in *Rhinoceros sondaicus*, although not so stout as in *Rhinoceros unicornis*; but judging from the available skulls they are more firmly attached to the maxillæ than in either of those species. There are seven young and adult skulls in the British Museum, and in not one of them are the premaxillæ missing.

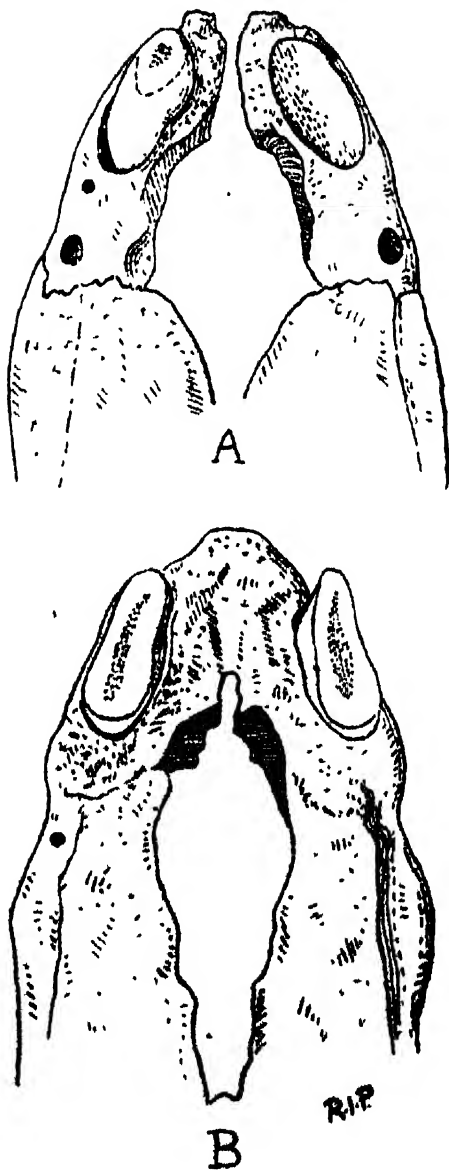
Two young skulls differ surprisingly in the extent of the fixation of these bones. In the youngest, a ♀ from Suam Lambah, British North Borneo (H. O. Rowe, 1.8.15.1), which has  $pm^4$  of the milk dentition still in use and the tip of  $m^3$  hardly visible in the bone, the premaxillæ do not quite touch in the middle line and are movable on the

Fig. 2.



- A. Lower side of the premaxillæ of an old skull of *Rh. unicornis* (722 d)  
 B. The same of a very old ♀ skull of *Rh. sondaicus* (32,10.211) from Perak.

Fig. 3.



- A. Lower side of premaxilla of barely adult ♀ of *Didermocoris samarensis* from Mogok, Upper Burma (31.5.28.1).  
 B. The same of very old ♂ from N. of Mt. Ophir, Malay Peninsula (70.6.14.2).

maxillæ. In the other, probably from Sumatra (Raffles, 1411 *b*), which is only a little older, still retaining the milk  $pm^4$  and showing only the tip of the imbedded  $m^3$ , the premaxillæ are not only firmly welded to the maxillæ but are ankylosed to a considerable extent in the middle line in front.

In an older but barely adult ♀ from Mogok, Upper Burma (E. H. Peacock, 31.5.28 1), with  $pm^4$  of the permanent set in full use, but only a little worn, and  $m^3$  half erupted, the premaxillæ are loosely joined to the maxillæ and can be brought into contact with each other in front. On the right side the tusk is a little worn in front and loose in its socket, and behind it are the alveoli of two shed functionless incisors. On the left side the tusk has dropped out and there is only one supplementary alveolus (fig. 3, A). An older skull from Pegu (Theobald, 1461 *a*), with  $m^3$  fully erupted and worn, differs from the last in having the premaxillæ immovably united to the maxillæ; and a skull from Cochun China (Boucard, 81.6.30.9), older than the last, resembles it in having the premaxillæ welded to the maxillæ behind and separated in front. On the other hand, an unsexed, very old skull from Siboga, S.W. Sumatra (Dr. Schreber, 94.9.24 1), and an equally old ♂ skull from Kian Putu, N. of Mt. Ophir, Malay Peninsula (purch. from Gerrard, 79 6.14 2) differ from the preceding in having the premaxillæ fused in front. In the Mt. Ophir skull the tusks are much worn and there is a small supplementary alveolus on the right side (fig. 3, B).

In these respects these two very old skulls resemble Raffles' immature skull, probably from Sumatra. This resemblance, coupled with the great difference in those particulars between Raffles' skull and the considerably older skull from Mogok, shows that the immovable fusion of the premaxillæ to each other and to the maxillæ is not purely a matter of age. Whether it may be a question of sex remains to be ascertained.

#### Summary.

In *Rhinoceros sondaicus* about 50 per cent. of the young and oldish available skulls have the comparatively slender premaxillæ missing, a defect attesting loose attachment to the maxillæ. In two adult skulls that



retain them they are freely movable on the maxillæ in a horizontal plane. In two very old skulls they are firmly fused to the maxillæ; and in the older of these, an aged ♀, they are ankylosed in the middle line in front, all trace of the suture being obliterated, and the complete ankylosis involves their anterior processes, which form a long, proximally wide, distally attenuated, triangular projection. In this species apparently immovable junction between the premaxillæ and maxillæ occurs only in old animals, and similar union between the premaxillæ themselves takes place only in extreme old age.

In *Rhinoceros unicornis*, in which the premaxillæ are thicker than in *Rh. sondaicus*, only 25 per cent. of the available skulls have lost those bones, the smaller percentage being due probably in part to the more extensive area of contact between them and the maxillæ. In this species, however, they may be firmly united to the maxillæ in young skulls and loosely united in oldish skulls. On the whole it seems that they become immovably fused to the maxillæ and more closely approximated in the middle line in front at an earlier age in *Rh. unicornis* than in *Rh. sondaicus*, although in only one of the skulls of the former, as of the latter species, do they actually fuse anteriorly.

In *Didermocerus sumatrensis* all the available skulls are provided with their premaxillæ, which are relatively about as thick as in *Rh. unicornis*, and seem to resemble more closely those of the latter in the age-variation of their fusion with the maxillæ and in their approximation to each other or ankylosis in front than they resemble those of *Rh. sondaicus*. But the figures illustrating some of the variations in the fusion or freedom of the premaxillæ in the three Asiatic species incidentally show that in *Didermocerus sumatrensis* the upper tusks are relatively much smaller than in the two species of *Rhinoceros*, their length being only about half that of the premaxillæ, excluding the anterior processes, whereas in *Rhinoceros* they are about three-quarters the length of those bones.

#### ERRATA.

"New Species of South African Staphylinidæ (Col.)," *Ann. & Mag. Nat. Hist.* (11) xi, 1944, by Malcolm Cameron.

Page 706, line 1, for "*minimus*" read "*minus*."

Page 718, line 4 from bottom, for "*Tachyusia*" read "*Tachyusa*."

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